H
7
32
6
.186

PRICE FORTY CENTS
ABROAD 1/8

BROMOIL PRINTS AND BROMOIL TRANSFERS

A summary of up-to-the-minute information about these two pictorial printing methods, with working instructions and formulas. Written by an expert and illustrated with typical examples. Notes and Comment. Books and Prints.

The Photo Miniature

VOLUME XVI : FEB—MAY, 1922 : NUMBER 186

NEW YORK—TENNANT AND WARD
LONDON—HOUGHTONS, LTD.

Published Monthly : Subscription Price, Postfree, per year $4 (Abroad 16/-)
Copyright, 1922, by Tennant and Ward, New York

The Photo-Miniature: No. 174

Home and Garden Portraiture

The only handbook to this fascinating field of work, in which the amateur can excel the best professional work, and the professional can find a gold-mine of new business.

Plain and practical information, from beginning to end, giving working methods and discussing the possibilities from the view-point of experience.

THE FIELD EQUIPMENT
LIMITATIONS OF HAND CAMERAS
LENSES AND THEIR USE
INDOOR ILLUMINATION
ROOMS, STAIRWAYS, DOORWAY, AND WINDOW PORTRAITS
REFLECTORS, BACKGROUNDS
LIGHT TONE EFFECTS
MIRROR PORTRAITS
DE MEYER EFFECTS
PORCH PORTRAITS
GARDEN PORTRAITURE
ILLUSTRATED

Price 40 cents postfree

TENNANT AND WARD
103 PARK AVE., NEW YORK

The Photo-Miniature: No. 142

Profitable Photographic Processes

A collection of minor processes, not available elsewhere, which photographers can turn to profitable account as side lines to the regular business of the studio.

Original information, with practical working instructions and formulas.

PHOTOGRAPHS ON WATCH DIALS, CAPS, SPOONS, COINS, ETC.

The carbon transfer and collodion stripping paper methods—complete.

PRINTS ON SILK, SATEEN AND FABRICS

IMITATION ENAMELS (Pseudo Photo Ceramics) ON CHINAWARE AND METAL SURFACES

BIRD'S-EYE PHOTOGRAPHS FOR NOVELTY SPECIALTIES

ENLARGEMENTS ON SATEEN AND OTHER FABRICS

Price 40 cents postfree

TENNANT AND WARD
103 PARK AVE., NEW YORK

PROFESSIONAL
CYKO

Take an attractive subject. Get the composition, the pose, the expression, just right. Then make the exposure, develop the negative, and print.

The result may depend on factors beyond your control — on the plate you use, on the paper selected for the print.

Artistic and technical skill are of little avail unless your paper registers depth and roundness, gives you the modeling of the features instead of a flat outline of them. The improvement obtained by the use of

PROFESSIONAL CYKO

is, to some minds, subtle. Yet that there is a difference — that Cyko portraits are more realistic — your own comparisons will show.

Length of scale and nicely-adjusted balance, resulting in a remarkable combination of luminosity and softness, are, with ease of manipulation, distinguishing characteristics of

PROFESSIONAL CYKO

Supplied in Buff, Plat, Semimatte, and Studio surfaces

ANSCO COMPANY
BINGHAMTON, N. Y.

The Photo-Miniature

¶ A monthly magazine of photographic information, edited by John A. Tennant, for the man who wants the plain facts about one thing at a time. It is unique among photographic journals in the following vital points.

¶ Each number is a complete book in itself. Each number deals with a different subject and tells all worth knowing about its subject.

¶ Its information is fresh and original, simply written, without waste of words or space, by practical workers from actual experience. Always clear and to the point, comprehensive, not long-winded.

¶ It is carefully edited, well printed and linen-stitched so that it opens flat like a book for easy reading. Its pages are compactly filled, giving as much information as the average dollar book, in flexible form, fitting the coat-pocket.

¶ Sold by dealers everywhere at 40 cents per copy [or 1/8 abroad]. Subscription, postfree $4 per year. [Abroad 16/-.]

¶ A complete set of all the numbers published: Volumes I to XVI offers the most comprehensive library of photographic information in the language. Apply to American publishers for price of sets or out-of-print issues needed to complete your set.

PUBLISHED BY TENNANT AND WARD
AT 103 PARK AVENUE, NEW YORK
Chicago Wholesale Agents: Burke and James, Inc.
Agents for Great Britain: Houghton's, Ltd., London
Agents for Australasia: Kodak (Australasia) Ltd., Sydney

The Photo-Miniature Series

OF PRACTICAL HANDBOOKS ON PHOTOGRAPHY

A List of Numbers Obtainable from Most Dealers:

No. 186. BROMOIL PRINTS AND BROMOIL TRANSFERS. Simple instructions in the working of these popular pictorial printing methods. Fully illustrated, with formulas. 40 cents.

No. 185. KALLITYPE AND ALLIED PROCESSES. For home prepared papers giving black, brown, sepia, red and blue prints. Reliable formulas. 40 cents.

No. 184. SOFT FOCUS EFFECTS IN PHOTOGRAPHY. By lenses, disks, screens, and other devices. Describes all soft-focus lenses. Illustrated. 40 cents.

No. 183. COLOR PHOTOGRAPHY. The best statement of the problem to date. By C. E. Kenneth Mees, D.Sc. of the Eastman Research Laboratory. 40 cents.

No. 182. THE PHOTOGRAPHIC STUDIO. Its Construction and Equipment. Illustrated. 40 cents. A practical guide for all intending to build or refit.

No. 181. THE AIR BRUSH AND THE PHOTOGRAPHER. A practical working manual for all the uses of the air brush in photography. Illustrated. 40 cents.

No. 180. PHOTOGRAPHY WITH A HAND CAMERA. A commonsense guide to successful hand camera work, giving the vital facts. Illustrated. 40 cents.

No. 179. PHOTOGRAPHIC EMULSIONS. The formulas and methods of an expert for making dry plates, lantern slide and process plates, development and bromide papers, emulsions on canvas, etc. 40 cents.

No. 178. PHOTOGRAPHY AS A CRAFT. Practical and pointed methods of varying the result obtained in negatives and prints, for those who know what they want before they begin. Illustrated. 40 cents.

No. 177. SELLING PHOTOGRAPHS TO ADVERTISERS. How to make money with your camera, producing and selling photographs for illustrating advertisements. How to get into the market. Illustrated. 40 cents.

No. 175. STEREOSCOPIC PHOTOGRAPHY. The only book on this beautiful but neglected method of photography which gives the perfect photograph. 40 cents.

No. 174. HOME AND GARDEN PORTRAITURE. Plain and practical methods for amateurs and professionals. Covers the whole field. Illustrated. 40 cents.

No. 173. FIGURES, FACTS AND FORMULAS OF PHOTOGRAPHY. Second Series, 1914-1918. A reference book. 40 cents.

No. 169. PHOTOGRAPHIC WORDS AND PHRASES. A pocket dictionary for instant reference. 40 cents.

No. 168. HOW TO DEVELOP THE NEGATIVE. A practical handbook to the twelve best methods. 40 cents.

No. 151. REFLEX CAMERAS AND FOCAL PLANE SHUTTERS. The only guide to photography with Graflex and similar reflex camera equipments. By an expert. Illustrated. 40 cents.

No. 142. PROFITABLE PHOTOGRAPHIC PROCESSES. Printing on fabrics, silk, etc.; watch dials and caps; imitation enamels, enlarging on fabrics; pictures on metals, charms, etc. 40 cents.

No. 115. PLATINUM PRINTING. A handy guide to the making of all sorts of platinum prints. 40 cents.

No. 60. WHO DISCOVERED PHOTOGRAPHY ? The most interesting account of the beginnings of photography and the men who made the first photographs. Illustrated, 40 cents.

SOLD BY DEALERS EVERYWHERE

TENNANT AND WARD :: *PUBLISHERS* :: NEW YORK

An Announcement of Unusual Interest to American Pictorial Photographers, Amateurs, Professionals and Art Students

A SPECIAL COURSE
OF ILLUSTRATED LESSONS ON

THE APPRECIATION OF

THE FINE ARTS

has been prepared by

F. C. TILNEY

the English painter and art critic, whose books and papers on art subjects, and critiques of the London salon and R. P. S. Exhibitions are favorably known to American art students

This course, the only one of its kind, is designed to meet the needs of those who seek a better understanding of the principles of art expression—so essential in picture making.

It affords, in six clear and enjoyable lessons, a valuable and rapid training in the formation of judgment and taste, giving the ground-work of a complete education in art matters.

It directly stimulates the student's power of expression in his work, by the creation of *feeling* and the development of his pictorial sense, based on knowledge.

Unreservedly praised by eminent artists, art teachers, students and the art and photographic press

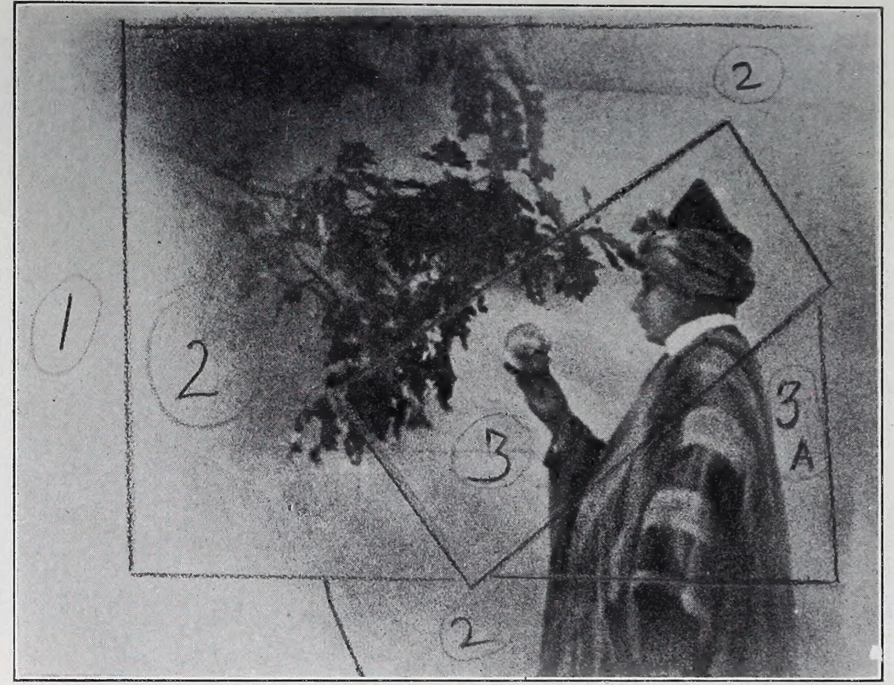
THE COURSE RUNS IN TWO SERIES

SERIES I: Comprises six booklets of from 32 to 64 pages each, with test papers by which the student can check his progress. The fee for this course is $5, sent with request for enrolment.

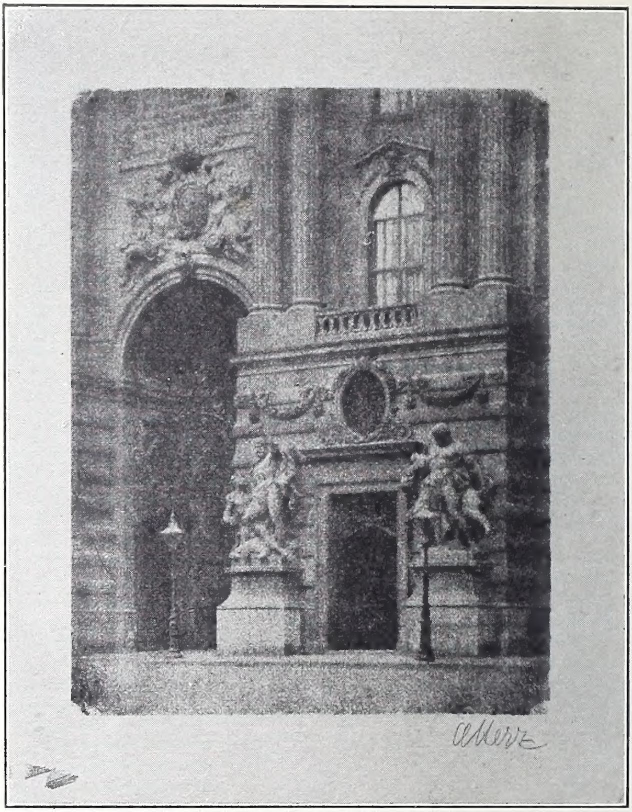
SERIES II: Comprises six Postal Lessons, given upon the student's answers to the Test Papers accompanying the booklets. These Lessons are individually written to meet the needs of the student, extending and supplementing the booklets, but full and complete in themselves. The fee for this service is $2.50 for each Lesson, remitted with the Test Paper and answers.

Correspondence and Remittances (International Money Orders at any Post Office) should be addressed to

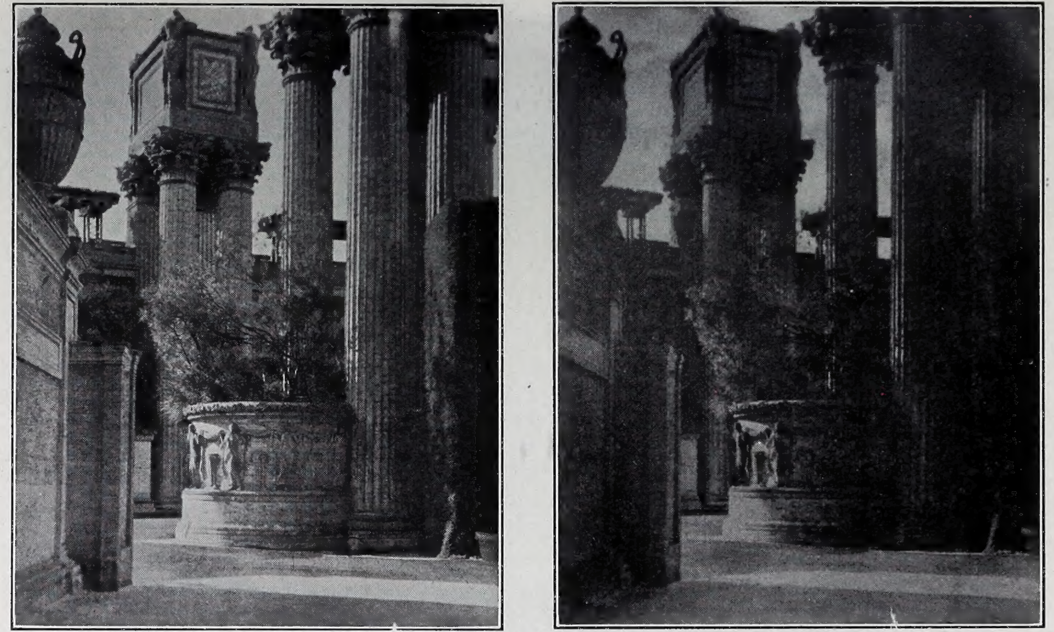
THE ART OF LIFE MOVEMENT
28 John Street, Bedford Row, London, W. C. I., England



Print showing the various stages in the making of a Bromoil
(1) Bleached print. (2) Inking begun. (3A) Inking three-quarters completed. (3) Inking completed
SOPHIE LOUISA LAUFFER



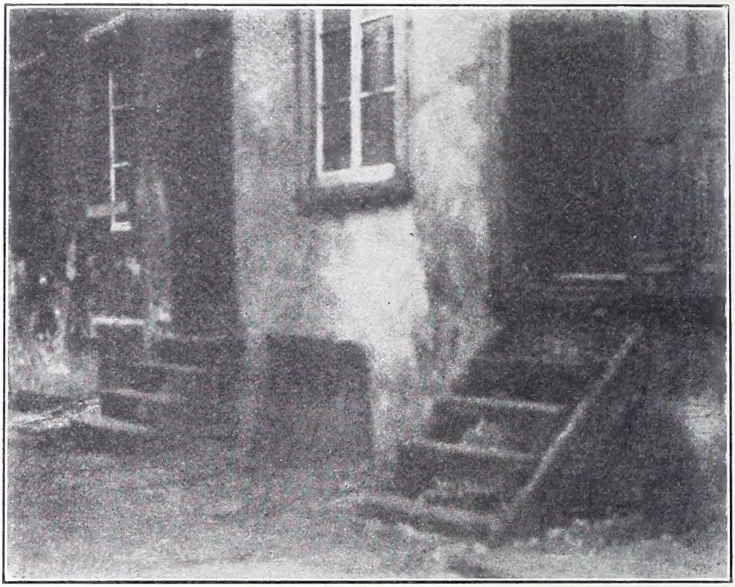
IMPERIAL PALACE, VIENNA
From a Bromoil Transfer 7½ x 9½
A. HERZ



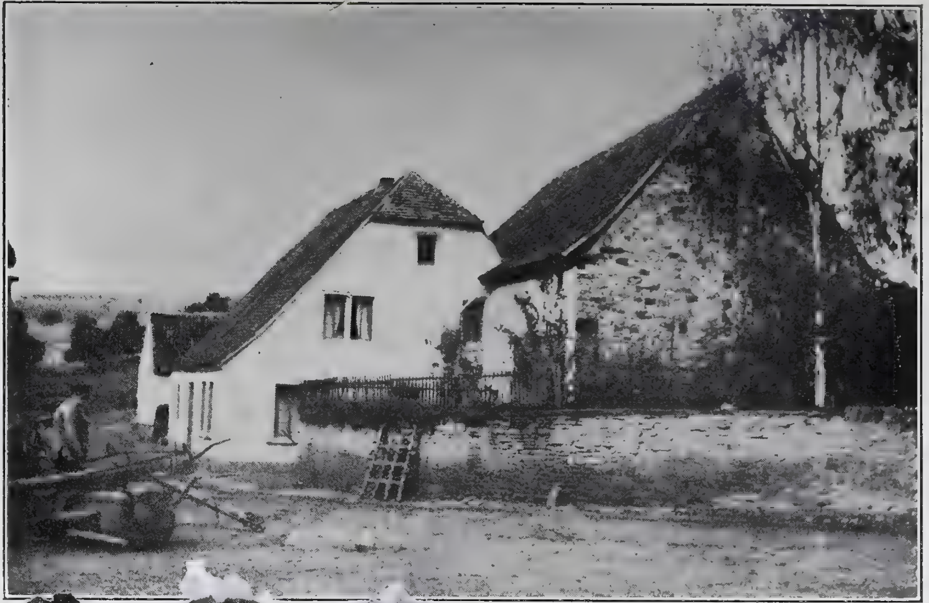
Straight Enlargement Bromoil

IN THE COURT OF THE COLUMNS

WILLIAM GORDON SHIELDS



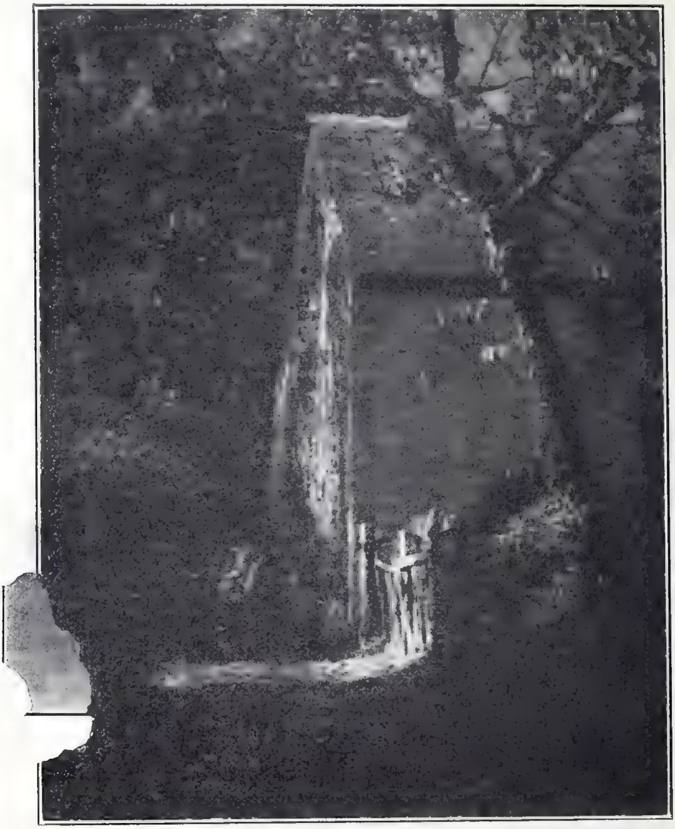
RELICS OF OTHER DAYS—QUEBEC
From a Bromoil Print, 10 x 13; 4 x 5 Graflex negative
WILLIAM A. ALCOCK



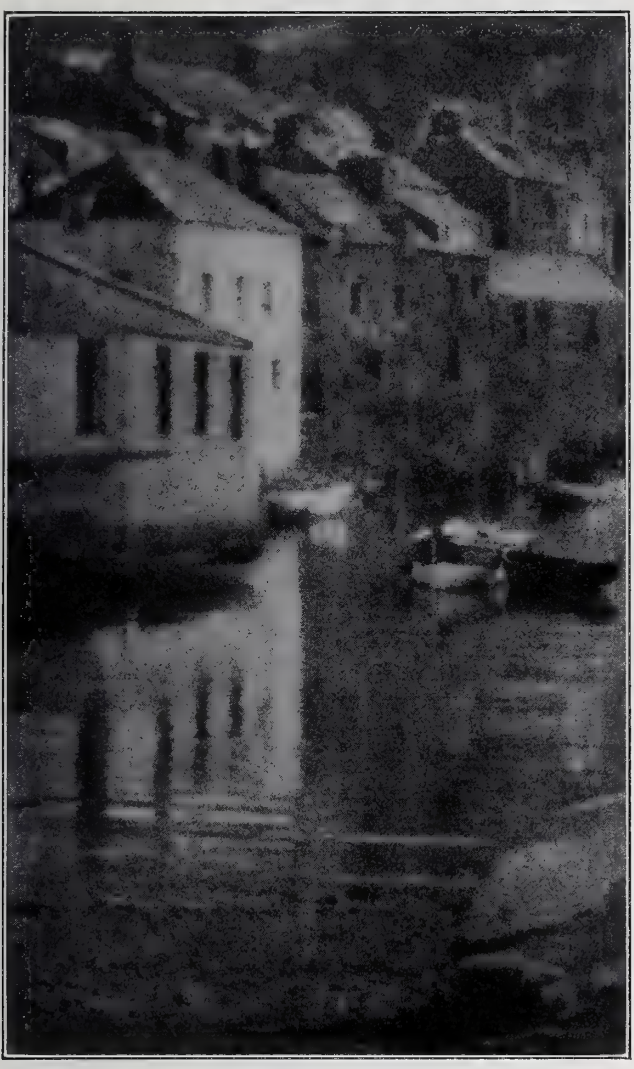
LD HOUSE

from a Brownie No. 2 negative

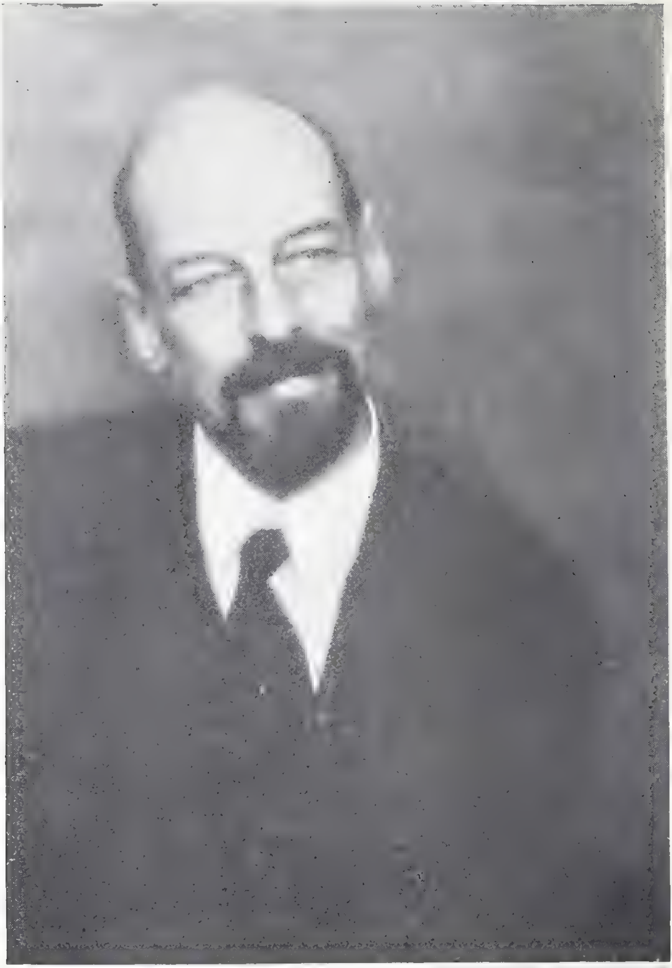
SOPHIE LOUISA LAUFFER



QUIMPERLE, FINISTÈRE
Bromoil 9 x 12, from a 3¼ x 4¼ negative
DR. A. D. CHAFFEE



POLPERRO, CORNWALL
Bromoil print, 7 x 11. See original, page 259
DR. A. D. CHAFFEE



DR. A. D. CHAFFEE
President of The Pictorial Photographers of America
From a portrait by RABINOVITCH, New York

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT
Volume XVI February-May, 1922 Number 186

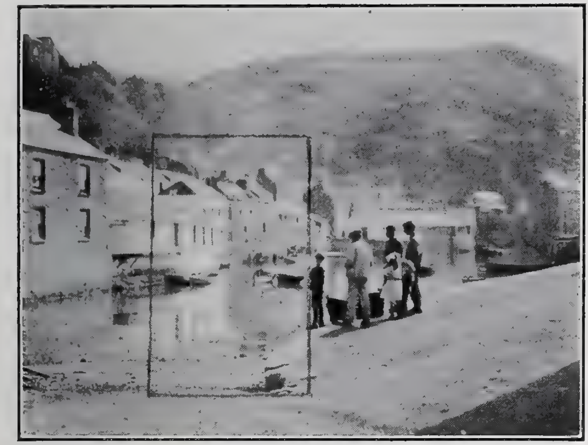
Bromoil Prints and Bromoil Transfers

The center of interest in photography is the picture-image in the print. As soon as the unrivaled capacity of the photographic process for the production of this image was realized, there arose two schools of photographers: the one seeking to perfect the process so as to secure scientific accuracy in the photographic image; the other seeking to control the process so as to obtain pictorial rather than mere mechanical accuracy in the print. Out of the enthusiastic activities of these two schools have come all the advances made in photography since its beginnings a hundred years ago. The scientific school gives us the technically perfect photograph of today—fact representation by means of the anastigmat lens, the color-sensitive plate or film and the modern development paper. The other school gives us what we know as the pictorial photograph—individual expression rather than mechanical representation, by variation and control in the use of the lens, plate and printing media. The familiar bromide print is typical of the first order; the less familiar bromoil print is the most recent example of the second order.

The bromoil process, then, is a pictorial printing method which has, as its chief interest, the almost unlimited control which it affords over the general character of and particular effects obtained in the print, together with the possibilities this control offers for individual expression. Obviously such a printing method is for the trained pictorialist who has learned to "see" and "feel," and therefore has a definite impression or individual visualization of his subject to express, rather than for the beginner in photography or the matter-of-fact amateur or professional who desires simply to record the physical facts of his subject in an acceptable way. For these the straightforward development papers offer the best possible media for obtaining in the print all that has been secured in the negative. But for the amateur with pictorial aspirations, who has a cultivated pictorial sense, who knows something of the significance of design in picture making and is sensitive to the subtleties of tone and color values in nature, possessing, withal, a lively imagination and a retentive memory, the bromoil process undoubtedly holds more interest and pleasure than any other printing method in photography.

What is a Bromoil Print? Simply a bromide print, generally an enlargement from a small negative or portion of a negative, in which the developed silver image is bleached out and rebuilt or reconstituted in a fatty ink or pigment which is applied to the bleached print with a brush. It is in this rebuilding of the picture-image in pigment, brush in hand, that the photographer can exercise the control over the finished print which is characteristic of the process. The accompanying illustration shows a "snapshot," with the portion marked which Dr. Chaffee enlarged and from which was evolved the charming bromoil of Polperro to be seen among the pictures engraved for this issue.

This substitution of a pigment image in place of the silver image of the bromide print is as absurdly simple in theory as it is complex and uncertain in practice. It is based on the fact that gelatine will absorb water and swell, in which condition it will repel an oil or fat. When the developed gelatine bromide print is placed in the bleaching solution, this exercises a tanning (drying or hardening) action on the gelatine film in every part of the image where there is silver deposited. This tanning action is proportional to the amount of silver deposited in the different parts of the image. As a result, when the bromide print thus proportionately tanned (and incidentally bleached) is soaked in water, the swelling and relief of the image will vary with the tanned and untanned areas of the print, and the tanned portions will "take" an oil or fat instead of repelling it as the untanned (and swelled) portions do. If now a colored fatty ink, made by mixing a color pigment with oil, is applied to such a wetted and swelled print we will get a visible record in pigment of the unswelled or tanned portions. This is the pigment image of the bromoil print and it is also a facsimile of the original silver image of the bromide print on which it is based.



The "snapshot" from which the bromoil of Polperro, Cornwall, was made

DR. A. D. CHAFFEE

The Bromoil Transfer. If, after rebuilding the picture-image in pigment on the bromide print base, as described, we place the freshly inked and wet bromoil print in contact with a sheet of drawing or other paper, under pressure, the pigment image will be transferred to the drawing paper and we will obtain a print in pigment on paper, similar to the collotype print or photogravure. This is the bromoil transfer.

Let us now get to the actual working of the process: how to make bromoil prints and bromoil transfers. In the instructions here given I have used a monograph prepared for these pages by Adolf Herz, an expert bromoilist who knows the process by long experience and whose prints are equal to the best I have seen. I acknowledge also the generous help given by Dr. T. O'Conor Sloane, Sophie L. Lauffer and William A. Alcock in the translation and revision of the text supplied by Mr. Herz. To Dr. A. D. Chaffee, William Gordon Shields, William H. Zerbe, Ben J. Lubshez and other American workers I offer my thanks for many useful hints and suggestions. May I add that, if the following pages seem to be overcrowded with detail and somewhat tedious in the reading, the reader should remember that the bromoil process, more than any other printing method, depends upon thoroughness and care in every particular, and is much simpler in the doing than in the description.

EDITOR

The Negative. The remarkable possibilities of modification and control offered by the bromoil process have misled some enthusiasts into the belief that the quality of the negative is of little importance in bromoil work. Thus a bromoilist whose prints have been accepted and hung in a dozen salons writes: "All this talk about the negative in bromoil is bunk. Mine are rotten." But a later paragraph in the same note adds, more wisely, "It is axiomatic that in any printing process the quality of the print depends upon the quality of the negative, and this applies with full force to the preparation of the print which is to form the basis of the bromoil." And there you are! A fine bit of hedging.

That the quality of the bromoil print is largely governed by the quality of the bromide print base is certain. An expert worker may succeed in evolving an attractive bromoil even from a poor bromide print. But for the average man the statement that you cannot get a good bromoil out of a poor or imperfect bromide print is much nearer the truth. And since it is certain that a good bromide print of the sort needed in bromoil work can be obtained only from a reasonably good negative, the quality of the negative obviously has a real importance in bromoil printing. By a reasonably good negative here is meant one fitted by its technical quality to give in the end result or print just the effects desired by the maker of the picture. Let us see what a few bromoilists of wide experience have to say on the point.

Definitions. Adolf Herz says: As most bromoils are made on enlarged prints, the negative should be one which gives a good enlargement in the ordinary sense, not necessarily an "artistic" enlargement, but a clean, crisp print with a long range of tones. An under-exposed plate is especially to be avoided since it will lack detail in the shadows. The plate should be softly developed, if possible without the use of potassium bromide, unless the exposure has been altogether too long. The highlights or densest portions of the negative should be sufficiently transparent to yield detail at these points in the print or enlargement. Clear shadows and opaque highlights are not desirable in negatives intended for bromoil printing. In brief, we need for bromoil work, a well exposed negative with an extended scale of densities or tones, firm in contrasts but free from fog, and sufficiently transparent to show every detail when viewed by transmitted light against a sheet of white paper, in front of which the plate is held as is usual in judging the density of negatives. A well-exposed orthochromatic plate, used with a filter and softly developed, gives a negative of this character; but ordinary plates and films will serve equally well if handled intelligently in exposure and development.

Raymond Crowther, fresh from extended researches in bromoil, is not inclined to compromise. He says: The negative should be of the highest attainable technical excellence and exhibit a full range of tones. It should be correctly exposed and developed.

James A. Sinclair says: Do not think that any kind of a negative will make a good bromoil print. A good negative is essential, especially to the beginner. It should be clean and delicate in character, free from fog and not having great density in any part.

Dr. A. D. Chaffee seeks to obtain in his negative the technical quality and effects desired in the print; so that he rarely, if ever, attempts material change as to these in the making of the bromoil. In his opinion, the chief usefulness of the bromoil process is the facility it offers to the pictorialist for softening or modifying the precise, mechanical character of the "straight" photographic print; for shortening or extending the scale of tones where this is desirable in the presentation of the subject; for subduing or suppressing insistent or distracting detail, and especially as a means of substituting for the somewhat rigid accuracy of the photographic record that vitalizing play of life and imagination which betrays the personal touch and feeling of the maker of the print.

European workers in bromoil favor a softer negative or one with less vigorous contrasts than that preferred by American bromoilists. It is possible that here we have an explanation of the exquisite delicacy and charm of the British bromoils shown on this side in recent exhibitions. Only in rare instances did these British prints exhibit the boldness and vigor characteristic of American bromoils.

Papers. The choice of a suitable bromide paper is an important detail in successful bromoil work today, and the beginner is warned to disregard the looseness of expression as to this point in his reading on the subject. When the bromoil process was first introduced (1907), it was commonly asserted that "any good bromide paper is suitable for the making of bromoil prints." As applied to the bromide papers of that time, and to pre-war papers generally, this was broadly true. But experience quickly proved that, even among these pre-war papers, some were less troublesome in use or gave better results than others. Whereupon careful writers abandoned such misleading generalities and specified the particular papers which had proved satisfactory in their practice.

With the war came radical changes in the quality of chemical materials and methods of manufacture. As one result of these changes, speaking strictly from the viewpoint of the requirements of the bromoil process, the bromide papers of today are very different and behave differently from those of pre-war days. This has naturally resulted in confusion and vexation among the older workers in bromoil. There is also complaint of a lack of uniformity in the quality of different lots of the same brand of paper, which crops out in unlooked-for difficulties and uncertainty in the successful working of the bromoil process. It is, therefore, impossible at present to name any bromide paper with which success in bromoil printing can be absolutely assured, so that experience is the only safe guide to follow. This, however, does not involve endless change and experiment. The beginner, having chosen his first paper intelligently, is advised to persevere with it, modifying his procedure to meet its peculiarities, and not to change from one paper to another too lightly.

Desiderata. In an interesting discussion of bromoil papers in *The Club Photographer* for April, Dr. A. D. Chaffee says that the ideal paper for bromoil should have an emulsion coating which, with or without visible relief, possesses the quality of acquiring in the bleach a selective affinity for the ink . . . hard enough to withstand the action of the ordinary bleaching formula without melting, crumbling or rubbing up; tough enough or elastic enough to retain the modelling of the image during prolonged and vigorous brush work, and giving an image free from granularity.

Raymond Crowther reporting the investigation of the Bromoil Research Club, in *The Amateur Photographer*, Nov. 30, 1921, says: Papers of the non-stress, overcoated variety are unsuitable for bromoil, as the emulsion is covered with a layer of hardened gelatine free from any image-forming constituents. Papers in which starch or any inert substances have been incorporated in the emulsion are also to be avoided; and paper with an unbaryted base should be selected, as tending to ensure a higher quality level of material as a whole. As an example he advises, for use in England, a paper coated with gelatine of such hardness as will imbibe sufficient water at 60° Fahr. in a quarter of an hour to repel completely the oily ink employed in pigmenting the bromoil image.

Expert Opinion. Lest this discussion of the shortcomings of available bromide papers should discourage the beginner in bromoil printing, a summary of expert opinion is here given to help the reader in his choice of papers. Incidentally it shows that almost every bromide paper in the market is used by one expert worker or another!

Adolf Herz, the skilled Swiss bromoilist whose experiences and methods make up the larger portion of this monograph, says: As to papers . . . there is no certainty except by trial and proof. I have had success with the *Wellington* Bromoil, *Illingworth* Bromure and *Gaevert*, Nos. 42, 43, 47 and 48 Papers.

S. Grimshaw, an English worker, writing in *The Club Photographer*, Feb. 1922, says: I can vouch for the following after personal trial. *Barnet* Ordinary, Smooth and Rough, and Tiger Tongue; *Kodak* Royal, White and Cream, *Kosmos* Vitegas, 20B and 21B, specially coated for bromoil. This last is a new paper not yet introduced into America. It is said to be a chloro-brom, as distinguished from purely bromide papers, and is classed among "gaslight" or development papers. Its appearance indicates that manufacturers may produce special papers meeting bromoil requirements.

William A. Alcock and Sophie Lauffer, two American enthusiasts largely responsible for the bromoil cult among our Eastern amateurs, advise the use of *Barnet* Platino-Mat in White, and Cream Crayon in Rough natural tinted stock, Tiger Tongue and *Eastman* P. M. C. No. 8; with the Williams Bleach, the Wellington B. B. papers; and, for pictorial work with any copper bleach formula, *Barnet* C. C.

The Brooklyn Institute bromoil group, including many successful exhibitors, use *Eastman* P. M. C. Nos. 5, 7 and 8, with most of the English papers already mentioned. W. H. Zerbe, who has initiated hundreds of amateurs into the mysteries of bromoil, uses *Barnet* and *Wellington* papers.

G. Bellamy Clifton, an English amateur who thinks that "bromoil is not for the many but for the few" because of its distressing uncertainties, prefers the *Ilford* bromide papers as giving him the soft, flat print he desires in the bromide base.

Dr. A. D. Chaffee, the recognized leader among American bromoilists, in the discussion of bromoil papers mentioned above, carefully refrains from specifying any particular brand or variety, thereby expressing his profound dissatisfaction with all post-war papers.

The Bromide Print which serves as the basis of the bromoil print may be either a direct contact print (if the negative is of the size desired in the finished bromoil), or an enlargement from a small negative. Usually it is the latter since bromoils smaller than 8 x 10 are rarely made.

What about this bromide print? Here again we meet the loose statement: "Any bromide print will give a bromoil print if you know how to handle it." It may. But it is indisputable that the technical or print quality of the bromoil is largely determined by the quality of the bromide print base. Why, then, risk failure! The better the bromide print, the better the bromoil. More than that, it is agreed that for really successful bromoil work the bromide print should have a certain and special quality of fitness for the requirements of the process. This quality makes for ease and certainty in manipulation as well as quality in results.

What Sort of a Bromide Print? Adolf Herz says: Not what is generally known as a perfect or faultless bromide print or enlargement, but a reasonably good print, somewhat over-exposed and fully developed so that there is a proportion of reduced silver in every part of the image. Pure whites, i.e. portions of the picture-image without silver deposit are to be avoided.

The sort of bromide print, says J. W. Gillies, which will give a good sepia by redevelopment, but not quite as dark as is usual in prints made for redevelopment; that is to say the density is to be obtained by forcing development to a certain extent, so that the silver deposit may extend through the emulsion.

As to this last point Raymond Crowther is not in agreement and states his reason. Mr. Crowther says: The best type of print is one correctly exposed and correctly developed; but not developed right through the emulsion to the paper support since, even in the darkest tones, there should be left a layer of untanned gelatine which will swell in the soaking process and effectively isolate the ink-absorbing surface from the paper support. This renders the removal of ink (pigment) easy and readily controllable when desired in the pigmenting of the bromoil. Most of the experts insist on full development, giving a print rich in tones and contrasts which look as deep by transmitted light as by reflected light.

The Developer. The bromide print to be used in making the bromoil may be developed in Amidol, Metol-Quinol, Azo (Activol) or Rodinal, but expert opinion is concentrated in the bald statement of Adolf Herz that Amidol is the one best developer for the purpose. He advises the preparation of an Amidol developer as follows: Dissolve 90 grains sodium sulphite (anhydrous) in 20 ounces of water in the developing tray. When the sulphite is completely dissolved, add 15 grains Amidol, which dissolves instantly. The developer is now ready for use.

Hector Murchison's formula, recommended by G. Bellamy Clifton in a recent bromoil demonstration, is as follows: Add 2 fluid ounces of a 10 per cent sodium sulphite solution to 16 ounces of water and, just before use, add to this 8 grains Amidol.

Miss Lauffer's formula is: Dissolve ¾ ounce sodium sulphite (cryst) in 20 ounces of water; add citric acid 25 grains; potass. bromide 10 grains, and finally Amidol 50 grains.

The reader unaccustomed to handling Amidol is warned that this developer, in powder form as purchased, forms a fine dust with great facility, which will remain suspended in the air for days. Wherever a particle of Amidol dust falls on wet bromide paper, a brownish-black spot results which cannot be removed or remedied. Mix your developer carefully.

Development. As Amidol develops rapidly, it is necessary to secure complete immersion of the exposed print quickly and without hesitation, so that uneven or spotty development of the image is avoided. For sizes under 10 x 12 the tray containing the developing solution is slightly tipped to one side, the dry, exposed paper, coated side uppermost, is pushed or slid under the solution and the tray gently tipped to the other side, so that the exposed print is evenly and completely covered by the sweep of the developer over its surface. Keep the tray in motion until development is complete, which stage is reached as soon as it is seen that the developer ceases to act. As already indicated, it is important that there shall be a silver deposit over the whole of the image, as the ink (color pigment) will not "take" where no silver deposit remains to receive the "tanning" action of the "bleaching" solution.

Fixing the Print. As soon as development is seen to be complete, the print is rinsed (not washed) in running water and immediately immersed in a plain hypo solution. A bath made by dissolving 8 ounces of hypo in 40 ounces of water is satisfactory. A freshly prepared bath is advised and this should be used only as long as it remains clear and colorless. The print should remain in the fixing bath, preferably kept in gentle motion to ensure the even and thorough action of the solution, for ten minutes to assure the complete dissolution of all the haloid salts (unaltered by exposure) remaining in the emulsion coating of the print. When completely fixed, the print is next thoroughly washed in several changes of water, or running water, so that every trace of hypo is removed.

A Curious Variant. This fixing and washing of the developed bromide print is invariably mentioned by writers on bromoil as the usual and final stage in the making of the bromide print base for the bromoil. It would appear, however, from a paper read by Arthur C. Banfield before the London Camera Club, that when the bromide print is expressly made for this purpose, this fixing may be omitted and the print bleached right after development. Mr. Banfield is reported as saying that "it was much better to bleach the print immediately after developing; there was a considerable saving of time, with a much smaller chance of getting stains. Each print, as soon as fully developed, was placed in a dish of running water, and the accumulated batch then washed for a quarter of an hour. They could then be handled with safety in artificial light, bleached, fixed, and finally washed again for a quarter of an hour in twelve changes of water before being hung up to dry." (Brit. Jour. March 30, 1922).

It is possible that this variant offers advantages as a short cut in the preparation of large batches of bleached prints at one time for later pigmenting. The beginner in bromoil, however, is advised to proceed along the lines of accepted practice, preparing the bromide print in the usual way and taking up its conversion into a bromoil print as a separate and distinct process.

Drying. Whether the bromide print should be dried at this stage or the actual making of the bromoil commenced straightway on the wet print, is a point about which experts disagree. The general practice up to this time has been to prepare several bromides at one time and convert them into bromoils at convenience any time within a month. Dr. Chaffee tells me that he is still bromoiling a supply of bromide prints made four years ago, before the commercial bromide papers began to show any substantial change in character. It would seem, however, that this drying process has a definite influence upon the "conditioning" of the print for the after pigmenting. Some say that it is necessary where the print is one delicate in tone and detail, i. e. free from heavy masses and presenting a variety of light tones with minimum contrasts.

One plan advised is to lay the washed print face up on a piece of clean, lintless blotting paper, and gently remove the excess of water with a pad of cheese cloth (known to our English cousins as "butter muslin"), then suspending the print by a clip to dry in a current of air away from all dust. Adolf Herz, on the other hand, insists that nothing (fingers, blotting paper or cloth) should come in contact with the gelatine coating at this stage, and so simply hangs the print to dry without treatment. It would seem that this is making "much ado about nothing;" but in bromoil printing the "conditioning" of the gelatine coating of the bromide is the vital point and, as chemists know, every wetting, soaking, swelling and drying of gelatine affects its condition and after behavior.

When the bromide print is dried at this stage it will, of course, be necessary to wet or soak it again before attempting the bleaching operation which forms the initial step in making the bromoil.

Preliminaries. Thus far we have discussed preliminaries—perhaps tedious, but necessary. An outline of the technique of the bromoil process has been given. We know that the bromoil print is evolved from a bromide print by the substitution of an oily-pigment image for the familiar black silver image of the bromide print. The preparation of a suitable bromide print base has been explained. And we have seen that the interest, usefulness or charm of the bromoil process lies in the possibilities of controlling the interpretation of the subject in the print in this substitution of one image for another. Let us now take up the working of the bromoil process.

Bleaching or Tanning. The first step in the making of a bromoil print is the removal of the visible image of the bromide print base, and the "conditioning" of the print so that it will "take" the ink or pigment which gives us the new image of the bromoil print. This is effected by immersing the print in a solution which simultaneously bleaches out the picture and tans the gelatine coating wherever there is silver deposited, this tanning action being proportional to the amount of silver deposited by development in the various parts of the original but now invisible picture image. The solution so used is known as the bleacher and the operation as bleaching the print, but tanning would seem to be a better term since the proper conditioning of the print for pigmenting (or inking) depends upon this reaction.

By the bleaching process the silver composing the picture-image is reconverted into silver bromide and is therefore susceptible to light action. It is well therefore, to complete the bleaching process either in artificial light or well screened daylight.

Bleachers. There are many formulas for this bleaching or tanning solution, and at least two commercial bleachers which are universally approved as simple and efficient in use. These are the Sinclair and Williams Bleachers, which may be obtained from dealers handling bromoil supplies.

Dr. Emil Mayer's Bleacher is so strongly advised by Adolf Herz as working perfectly with most papers, that I propose to give this formula and the method of its use in detail, afterwards adding other recommended formulas as alternative bleachers.

Prepare the following Stock Solutions. I: Water, 4 fl. ounces; potassium bromide (KBr), 1 ounce. II: Water, 4 fl. ounces; copper sulphate ($CuSO_4$.), 1 ounce. III:

A saturated solution of potassium bichromate ($K_2Cr_2O_7$) in water. For certainty of results the use of "chemically pure" salts and distilled water is advised.

To make the bleaching solution, take 3 parts of Solution No. I, 3 parts of No. II, and 1 part of No. III. To each 5 ounces of this mixture add one drop of concentrated hydrochloric acid. Dilute with 3 parts of water for use. This solution keeps well and can be used repeatedly. As its action is dependent on the amount of hydrochloric acid, it is important that this should be correctly proportioned as given above.

Bleaching. In this method, the dried bromide print is first soaked for half an hour in pure cold water to ensure the complete saturation of the gelatine coating of the paper. Then the wet print is put into a clean tray and the bleaching solution is poured over it. The temperature of the bleaching solution should be between 65° to 85° Fahr. according to the season. A little warmer than the average living room is satisfactory.

In this bleaching solution the picture-image gradually disappears, the process usually being complete in from 3 to 20 minutes (according to the composition of the bleacher, the kind of paper, etc.). Give the bleaching solution time to do its work. The very faint image sometimes remaining after bleaching is completed may be disregarded as merely the secondary color-image of the oxidization products of the developer.

Washing. The print is removed from the bleaching bath and washed for 10 minutes in running water. Note that some workers say "tepid water." Blisters are apt to come if there is any material change in the temperature of the baths and wash waters employed.

The Acid Bath advised for use after this bleaching solution should be previously made up by slowly adding ½ ounce of concentrated sulphuric acid (with constant stirring) to 40 ounces of water. The bleached and washed print is immersed in this and the solution kept in motion for 20 minutes. In this bath the faint image remaining after bleaching quickly and completely disappears.

Variations. The use of this after acid bath, by the way, is peculiar to the earlier bleaching formulas, such as that recommended by Herz. In the more recent formulas, the acid is incorporated in the bleaching solution, or an acid fixing bath is advised after bleaching and washing. The acid bath after bleaching, however, has its good points, as to remove all traces of the image where bromoils in color are attempted, or to soften an unusually hard gelatine coating, in which latter case the proportion of acid to water is usually 1 to 20. I give a few alternative Bleacher formulas.

Grimshaw's Bleacher. Prepare the two Stock Solutions as follows, I: Water, 30 ounces; copper chloride, 1 ounce; common salt, 8 ounces; hydrochloric acid, 10 minims. II: A. 1 per cent solution of potassium bichromate. For use, take 1 ounce each of Nos. I and II, and add 2 ounces of water.

This bleacher is preferably poured over the dry print (without preliminary wetting or soaking) and, when the image has faded to a pale yellowish-green, the print is rinsed in water until free from yellow stain, which takes from 1 to 3 minutes. It is then transferred to a 5 per cent hypo bath at 75° Fahr. for 5 minutes, after which it is washed in cold (tap) water for from 30 minutes to 3 hours. If it is desired to completely remove all traces of the image, the print is immersed for 1 minute in a 1 per cent solution of Thiocarbamide to each ounce of which 1 drop of sulphuric acid has been added.

Grimshaw's Special Bleacher, for use with the Vitegas chloro-brom papers, is given by Mr. Alcock as follows: Water, 40 fl. ounces; copper sulphate, ½ ounce; potassium bromide, ½ ounce; potassium bichromate, 15 grains; acetic acid (specific quality not mentioned), 10 minims. This bleaching solution is used at 65° Fahr. which temperature is advised for all the baths and waters employed. When the print is bleached, wash for 10 minutes, fix in a 10 per cent hypo solution for 10 minutes and wash for 30 minutes, after which the print is ready for immediate pigmenting, without drying.

W. H. Zerbe's Formulas are as follows: With Wellington Bromoil papers; Water, 14 ounces; copper sulphate, 10 drams; potassium bromide, 10 drams; saturated solution of potassium bichromate, 2 ounces 2 drams; hydrochloric acid C. P., 30 minims. For use add 3 parts of water to 1 part of this Stock Solution.

With softer papers or inks the Namias bleacher, amended as follows, is advised: Water, 35 ounces; copper sulphate, 180 grains; potassium bromide, 130 grains; chromic acid, 20 grains. In use both these bleachers are followed by the print being washed for 10 minutes and then immersed for 5 minutes in an acid bath made up by stirring 2 drams of sulphuric acid into 25 ounces of water. After this wash the print for 5 minutes and fix in a 10 per cent hypo solution for 10 minutes. Wash again and hang the print to dry. Do not lay print flat.

Raymond Crowther suggests the following as an ideal bleacher: Crystal copper sulphate 10 per cent solution, 170 minims; potassium bromide 10 per cent solution, 130 minims; chromic acid 1 per cent solution, 45 minims; water to make 3½ ounces. This bath should bleach the image in 3 minutes at 60° to 65° Fahr. After a further minute in the bleacher the print should be well washed and fixed in a neutral fixing bath composed of a 10 per cent hypo solution to each fluid ounce of which has been added 1 grain of potassium metabisulphite. Fix for 5 minutes, wash 15 minutes, and the print is ready for pigmenting without drying or further soaking. If dried before pigmenting, then 5 to 10 minutes soaking of the print will put it into condition for pigmenting.

Edward Clement, in *The Amateur Photographer* of Jan. 18, 1922, reports an extended series of experiments with thirty bleachers and all makes of papers. From the numerous tests made, the following bleacher was selected as being the most generally satisfactory. This conclusion was based on: (1) The print taking the ink readily; (2) the depth and richness of the shadows; (3) the clearness of the highlights; (4) no loss of half-tones or detail; (5) the surface of the gelatine was not rendered tacky; (6) the readiness of the ink to transfer, if desired.

Bleacher (Stock Solution). Pure copper sulphate, (10 per cent solution) 16 drams; potassium bromide (10 per cent solution), 14 drams; potassium bichromate (10 per cent solution), 30 minims; chromic acid solution (1 dr. = 1 gr.), 1¼ drams. For use, 2 ounces of cold water were added to each ounce of the stock solution.

After bleaching thoroughly (3 to 6 minutes) the prints are washed and fixed in acid hypo (2 to 3 minutes), well washed again and hung up until bone dry.

Ferricyanide Bleacher. Before the copper bromide bleacher now universally employed was introduced, a ferricyanide bleacher was the general favorite. This bleacher is more rapid in action than the copper bleacher and calls for a fairly vigorous or plucky bromide print, fully developed. As this ferricyanide bleacher is still used by bromoilists of repute, Dr. Chaffee among them, I give a typical formula. Prepare in five bottles 10 per cent solutions as follows and take for the bleacher: 10 per cent potassium bichromate solution, 4 drams; 10 per cent potassium bromide solution, 2 drams; 10 per cent citric acid solution, 2 drams; 10 per cent potash alum solution, 8 drams; water to make 10 ounces. When the print has been completely bleached in this solution, rinse it in water and immerse in a 5 per cent sulphuric acid bath, made by slowly adding ½ ounce pure sulphuric acid, with stirring, to 10 ounces of water. Rinse the print in five changes of water and fix in a bath made of 1 ounce hypo; ½ ounce sodium sulphite (cryst), with water to 10 ounces. After 5 minutes in this bath wash the print well and it is ready for pigmenting or can be dried for after pigmenting as may be desired.

It would easily be possible to fill this little book with formulas for bleachers, but a sufficient variety has been given for all the requirements of the different papers.

Final Fixing and Washing. Whatever bleacher or bleaching method is employed, and whether the print has been fixed before bleaching or bleached immediately after development, the bleached and washed print must again be fixed and washed before it is ready for pigmenting.

For this final fixing Herz and the majority of bromoil workers advise the immersion of the print for 10 minutes in a plain or neutral (non-acid) bath of hypo, 1 part; water 10 parts. Alcock and some others advise a 5 per cent hypo bath, to each fluid ounce of which 10 grains of sodium sulphite are added. Crowther, as we have seen, suggests that the addition of 1 grain of potassium metabisulphite to each ounce of the 10 per cent hypo bath is advantageous following the use of the bleacher he advises. He fixes the print for 5 minutes only.

After fixing the print should be washed for 15 minutes. If several prints are washed together, care must be taken to keep them in motion so that each print will be thoroughly washed. At this stage many varieties of paper exhibit a considerable amount of relief, while others seem to lack this relief, but either condition may be disregarded as far as indicating the condition of the print for pigmenting is concerned.

Drying. Most bromoil workers are agreed that the best bromoil prints are obtained from bleached prints which have been slowly and thoroughly dried, and then re-wetted by soaking in water before pigmenting. This is a convenient procedure, since it enables one to prepare several prints for pigmenting at one time, and to take up the actual pigmenting at one's leisure.

Herz insists upon the perfect drying of the print, saying that this drying, with the necessary soaking before inking, has an important influence upon the conditioning of the print. Recalling what has been said of the nature of gelatine, this seems reasonable. He further states that the slower the drying and the longer the print is kept in a thoroughly dry state after bleaching and before pigmenting, the more readily and perfectly will it "take" the ink used in pigmenting and the better the quality of the finished bromoil.

On the other hand there are those who prefer to proceed to the pigmenting or inking of the print right after bleaching, fixing and washing. This, they say, gives prints equal in quality to those by the other method, with the convenience of being able to complete the bromoil in one operation.

The vital point is the proper conditioning of the print. Just when this stage is reached is difficult to describe in type, being a matter of touch or feeling to be acquired by experience. Thus the expert bromoilist can usually tell, by the touch or "feel" of the print, just about how the pigmenting will "go." Grimshaw says: A print in good condition for pigmenting will feel distinctly "slippery" in the highlights, whereas the shadows will feel harsh and rough on drawing the finger across the surface.

The sense of touch or "feel," however, is so differently developed in different individuals that this is but a rough test. In some cases and with some papers the condition of the print can be judged by the relief observable when the print is viewed from a sharp angle. But this is not as reliable as the "feel" test.

Materials for Pigmenting. Before taking up the details of the coloring (inking or pigmenting) of the print, by which the picture image is built up or evolved on the bleached silver image, we must know something about the tools and materials required for this operation. These are brushes (or a roller), oil pigments (fatty inks or colors), and a desk or work table to work upon, with a few sheets of good, lintless blotting paper such as the World Blotter, and a chamois skin or soft (lintless) linen rag for drying the print.

Bromoil Brushes are of a special kind and shape, sold only by the few dealers carrying bromoil supplies, and are made of various materials, generally the hair of outlandish beasts, e.g. sea otter's hair, bear hair, pole cat hair and skunk, usually the last. Other favored brushes are made of hog's hair, fitch and substitute fitch; the common paint store hog's hair brush and shaving brushes are anathema. Sometimes bromoil brushes are sold under the names of the workers who first recommended them, e.g. Mortimer and Demachy brushes; or by their shape, as stag's foot brushes. The quality of the pigmenting brush is important. The best brushes are round in the spread, made of stiff but elastic black hair, with dome-shaped ends cut obliquely, thus resembling a stag's foot. The stiffness and elasticity of the brush is a factor in successful pigmenting; the stiffer the brush, the greater will be the contrast in the print, and the greater the danger of abrading the gelatine surface of the print in applying the pigment.

While the persistent bromoilist can hardly have too many brushes of different sizes and character, a few really good brushes are more to be desired than a large variety of poor brushes. For a start it is suggested that a No. 14 (11-16th inch at the handle) or a No. 12 (5/8th inch) with a few smaller brushes (Nos. 8 and 4) for fine detail will be sufficient for prints of 8 x 10 inches. Large brushes are preferable as they do the work quicker. A small brush, cut straight at the base and fastened in a quill mount will often be useful.

Rollers. For rapid pigmenting, the obtaining in the bromoil of a perfect facsimile in pigment of the original bromide print or in other cases where a very fine grain is desired, Continental bromoilists apply the pigment to the print with a roller instead of a brush, a method similar to that used in lithography and collotype printing. This practice has not yet obtained a footing among American or British workers, probably because suitable rollers are not available. It goes without saying that the use of the roller does not permit of as large a degree of local control or change in the print as is possible with the brush.

The bromoil roller resembles the familiar roller squeegee used by amateurs in mounting photographs, but the roller is larger in diameter, after the fashion of a lawn roller. It consists of a wooden core or spool 2½ inches in length and ¾ inch in diameter, overlaid with soft sponge rubber about ⅝th inch in thickness, which is provided with an outer covering of thick soft plush to form the inking or pigmenting surface.

Pigments. The quality of the colors, inks or pigments and especially their consistency, i. e. hardness or stiffness or softness, thinness or thickness, are vitally important in bromoil printing. The bromoil image is extremely susceptible or sensitive to the least change in these qualities in the pigments used. If the pigment is too thin the image will be muddy; if too thick or hard the image will be "contrasty."

Theoretically any good "fatty ink," such as printers', lithographic or collotype inks, or oil pigments "made at home" by mixing powder colors with Japan gold size and raw linseed oil, can be used for bromoil pigmenting. But in practice the special inks prepared for bromoil printing will provide a less expensive and more certain way to success. The Sinclair inks and Rawlins' pigments are altogether satisfactory. Charbonelle (Paris), Lechertier Barbe; Ltd. (London) and Horsell (Leeds, Eng.) also offer special inks for bromoil which are warmly recommended, and some American workers have used successfully the stiff lithographic inks made by Sinclair & Valentine and Ullman Co. of New York.

The beginner is advised to start with Sinclair's "Encre Machine," a hard, warm black pigment which may be softened, if this is necessary, with the addition of a very little "Encre Taille Douce." If brown prints are desired, then Sinclair's "Brown" and "Brown Black" pigments are indicated. For thinning or reducing the consistency of the ink used, Roberson's Medium or megilp is generally advised. All the makers mentioned supply their inks in many colors and in "hard" or "stiff" and "thin" or "soft" varieties. The stiff inks are most desirable for the beginner. The "soft" inks are used to mix with the "hard" for transfers.

As already indicated the consistency of the ink or pigment used must have attention, this varying with the temperature, all inks being thinner in summer than in winter. Difficulties in pigmenting may often be traced to this cause. Thus inks kept in a cold place may be too stiff for successful pigmenting in winter, while during the summer months they will become too thin and give endless trouble. The remedy is to condition your inks according to temperature and secure a normal temperature in the workroom before beginning to pigment.

Worktable. For convenience in working a stoutly built table should be provided, preferably with a "lino" or washable top. A piece of heavy plate glass, papier maché slab or board covered with oil cloth, comfortably larger than the print to be pigmented and firmly set at a slight angle to the table top, is generally used as the immediate support for the print. Since it is essential that the print be kept thoroughly moist during the pigmenting, many workers place on the glass or other support a wetted pad of several sheets of lintless blotter, over which is stretched a piece of absorbent cotton cloth, previously wetted and wrung to get rid of superfluous moisture. On this the wet print is placed for the pigmenting.

Herz simply uses the plate glass slab, without the moist pad, etc. keeping the print in proper condition, if the pigmenting takes longer than usual, by re-soaking it from time to time. Here the practice of the individual worker governs.

For drying the wet print just before pigmenting a piece of absorbent linen cloth or chamois skin is indispensable. If it is linen it must be lintless. Many workers prefer chamois.

Preparing for Pigmenting. We have seen that the successful inking or pigmenting of the bromoil depends wholly on the proper "conditioning" of the gelatine coating of the bromide print base. According to several skilled bromoilists this conditioning is effected by the developing, bleaching, fixing and washing of the bromide print, so that it is ready for inking up immediately after the final washing. On the other hand there are those who insist that a slow and thorough drying of the bleached print is necessary for the proper conditioning of the print for pigmenting.

Before the well dried, bleached print can be inked up, it must be soaked in order to obtain the necessary differential swelling of the image required for pigmenting. For this the print is put into a tray of water at ordinary temperature and soaked until the gelatine coating is completely saturated and a swollen relief image is obtained. Just how long this soaking must be continued cannot be determined generally for all sorts of papers, bleaching solutions and procedures.

Herz says: until the picture-image shows matt on the shining swollen gelatine and that often a visible relief image means that the coating is too much swelled. Sinclair says: I soak the dry print in water at 75° Fahr. from 30 to 45 minutes, then dry and start inking up. Banfield advises 3 minutes soaking at 65° Fahr. or until the print lies perfectly flat and limp. It then holds the minimum of water and is ready for pigmenting with a hard ink. He varies the consistency of his inks according to the amount of water held in the gelatine coating of the print, this varying according to the soaking given. Crowther says that 5 or 10 minutes soaking of the dried print in water at ordinary temperature is sufficient. Zerbe says: soak the print in water at 80° Fahr. until sufficient relief is obtained, which will depend on the make of paper used. And there are those who speak of soaking the print for from 2 or 3 hours to 12 hours at 70° to 80° Fahr.

It is not altogether a question of obtaining a certain degree of relief, but of the proper or differential swelling of the untanned gelatine in the different portions of the picture-image. As to the relief, sometimes an image in vigorous relief will not ink up at all, while others with hardly any visible relief will ink extremely well.

So, the dry print is left in water at ordinary temperature until it is completely saturated and lies flat and limp. This may take a few minutes or half an hour according to the hardness of the gelatine in a particular case.

When removed from the soaking tray, the print is placed, face up, on the wetted blotter pad or glass plate provided as a pigmenting support and carefully dried, by which is meant simply the removal of all excess water from the surface coating of the print. To do this the lintless linen cloth (an old, soft handkerchief is excellent) or chamois is spread evenly over the print and stroked a few times with the palm of the hand. The cloth is lifted off, and the print viewed obliquely in the light to see whether there is any water remaining on the surface. If there is, the drying operation is repeated until the coating is seen to be quite free from any water in streaks or drops. While the print needs careful handling at this stage to avoid breaking the tender gelatine coating, one need not fear good pressure of the hand on the drying cloth or chamois, provided that there is no dragging or rubbing of the surface of the print. It is well to always leave a margin of clear paper surrounding the picture image in the print. This will swell in relief when the print is soaked for pigmenting and protect the edges of the image during the inking.

Pigmenting. Squeeze out a very little stiff ink, about the size of a pea, on an upper corner of the palette or piece of clean waste glass used for this purpose. Spread the ink thinly, with a spatula or palette knife, in a circle of about two and a half inches in diameter. Now dip the points of the brush lightly in the ink, so that the tips of the hairs only are charged with color, and lightly stipple or dab the color on a clean part of the palette. This, with the rubbing of the ink with the spatula mentioned above, works the color to a smooth, homogeneous consistency and assures its even distribution on the points of the brush. One should never apply unworked ink on a print as this will surely result in spottiness and uneven coloring.

With the brush thus lightly charged with ink, the parts of the picture image in strong contrast, i. e. where a shadow and a highlight meet, are first attacked. These parts are easily located by means of a pilot print placed alongside the print being pigmented, or by memory or the relief visible in the print itself. In applying the ink the brush is held vertically, plummet fashion, by the end of its handle between the first two fingers and the thumb, so that it hangs vertically over the print and swings freely in any direction.

Brush Action. The touch of the brush or its action on the print is a light tap, thrust or dab, which transfers the ink from the hairs of the brush to the gelatine image where this is receptive of color. Effective brush action is, of course, a matter of individual touch or feeling acquired in practice. The worker will quickly learn the varied effects produced by different touches or handling of the brush, and how to use these to obtain a desired effect or result. Thus a slow "pressing" or caressing touch of the brush, sometimes described as a dragging movement, will deposit a maximum of color, thus producing a heavy tone perhaps desired in the shadows of the print. This touch is generally used where softness is aimed at. On the contrary, quickly repeated dabbing touches, four or five to the second, the points of the brush bouncing as it were without seeming to leave the surface of the print, will deposit a minimum of ink, actually removing it and so tending to contrast, which may be desirable in the lighter tones of the print. Again, this quick bouncing motion with a dry brush will remove still more ink and tend to softness of detail.

As the brush is cut obliquely, the point first touches the paper; the light pressure bends back the hairs of the point, so that the whole surface of the brush comes into play. This slipping or movement of the hairs over the gelatine image is the touch to be acquired, which develops or builds up the pigment image.

In practice the brush should swing freely from the fingers, always under control and moving in a circular path with a light and rapid stippling motion over the print. When the ink on the brush is used up, this should be re-charged and the pigmenting continued until the whole print is covered and the image appears with its normal contrasts.

If the print, as prepared, is in proper condition for pigmenting, i. e. takes the ink properly, this straightforward inking should give a clean reproduction of the original bromide print. When this is obtained, the happy bromoilist can proceed to exercise the "control" peculiar to the process, adding, taking away, suppressing, "pulling together" or whatever may be needed to secure the pictorial effects desired. The amount of time and work given to this pigmenting varies with the "condition" of the print, the variety of paper ink, etc. employed, the skill of the worker and his ideals as to the finished print. R. Crowther says that a straight bromoil, i. e. a replica of the original bromide, should be perfectly inked up in about 5 minutes, provided the bleached print is in proper condition for pigmenting. Arthur C. Banfield says that half an hour is sufficient for the inking of a 15x18 print. Others, meeting with difficulties in getting the image to "take" the pigment properly, or seeking to obtain certain effects not in the original print, are content to spend from 1 to 3 hours in pigmenting the print.

Re-swelling. If, on this first attempt to ink up the print, the image does not appear, this indicates that the relief is insufficiently developed and a further swelling is necessary. To effect this, the print is removed from the pigmenting support and immersed in warm water at say 80° to 115° Fahr. for 5 minutes. The warmer the water is the more strongly will the relief be developed. With some papers a temperature of 140° Fahr. may be needed; but care is needed at this point as, when once a certain degree of swelling or relief is attained it is difficult to reduce it, therefore it is advised to begin with cold water and increase the temperature of after soakings only if absolutely necessary. An excessive temperature in soaking the print weakens the gelatine for after brush work. Also, the higher the relief of the image, the more abrupt is the tone scale of the finished print and the stronger its contrasts. Sometimes it is advised to add minute quantities of ammonia, caustic soda or potassium carbonate to the water used for these supplementary soakings of the print, but the action of these alkaline baths is uncertain and often harmful. It is better, therefore, to use water only at various temperatures.

After this re-soaking, the print is replaced on the pigmenting pad and carefully dried with the linen cloth or chamois as before. The brush is very lightly charged with color and the whole surface of the print inked up in the manner already described. This will usually bring up a recognizable image, even though the contrasts may be insufficient. When the print has a light coat of color as the result of this second inking up, it may again be immersed in cold water for a few minutes, replaced on the pigmenting support, dried as before, and gone over with the empty brush (without color) with a light stippling touch. This repeated soaking is very helpful. The development of the picture can be accelerated if the wet image, after the re-soaking, is lightly rubbed over with a dripping wet wad of absorbent cotton before drying and re-inking. This manipulation seems to effect more in a few seconds than working over with the brush will do in some minutes. After treatment with the wet cotton wad the print is dried with the cloth or chamois as before, and observed to see whether the picture-image has sufficient contrast, or whether it is too flat. In the latter case it must be given another swelling in warmer water for a few minutes.

Building Up. When sufficient swelling or relief has been attained, the print is replaced on the pigmenting pad, dried as before and re-inked. The brush is now charged with rather more ink and the shadows in the picture given a sufficiency of color or ink to produce the richness and depth of tone desired. But in all this pigmenting, remember that it is better to apply too little ink at a time than too much. A too thinly inked print, of course, looks thin and mottled in coloring, the richly colored and fine grained print resulting from a generous coating of well worked pigment.

Do not be afraid of going over the print again and again, varying the brush action and the amount of ink carried by the brush according to the effect desired in different parts of the picture. It is by this continual brush action on the relief image that one obtains the long range of tones and that peculiar richness of effect which distinguish the bromoil from the plain bromide. It is well to use a large brush for this all-over inking-up, reserving the small brushes for local touches, clearing up the highlights and detail work.

Warm water, wet cotton wadding and frequent soaking of the print during pigmenting, all operate to give the picture brilliancy without hardness. Stiff brushes, hard ink, and the use of a roller in place of a brush for applying the pigment have the same effect.

Hopping. The method of brush action known as "hopping" is an aid in helping to increase contrast. In this method, a quick tapping or staccato motion of the brush is used, literally dropping the point of the brush from an inch or so above the print and quickly lifting it three or four times per second, which removes color from the part of the image as treated. A wire holder or "hopper" is obtainable, which so holds the brush in use that the spring of the wire handle facilitates the hopping movement. A too vigorous or prolonged hopping will, of course, break down or abrade the gelatine coating and so ruin the print. Evenness of effect and a fine grain throughout the print are obtained by repeatedly going over the print with the brush very lightly charged with color, or even without recharging it. This also has the effect of bringing out or extending the gradation of the image. Contrast is secured by "hopping."

Dirt. If from new brushes or any other cause the print becomes generally dirty, it can be cleaned by saturating a wad of absorbent cotton with benzine and rubbing this over the print, which will completely wash off the picture. *Don't do this near a naked light.* As soon as the benzine has evaporated, re-wet the print, dry and it is ready for re-inking. This washing with benzine can be repeated without injury. Usually the re-inking after the benzine washing goes faster than in the first pigmenting. Small specks of dirt or hairs can be removed with a pointed bit of soft rubber.

Clearing the Image. When the inking up of the print has been satisfactorily completed, a strong stream of water running over the print will clear the image and impart a soft, velvety quality to the gradations of the picture. For this the print is placed on a sloping board, as in gum-bichromate work and fastened down with pins. A stream of water is then allowed to play over it for a few minutes until the image is seen to be cleared up, after which the print is stretched out to dry.

Control. The control advantages of the bromoil process result from the latitute of manipulation provided in the pigmenting operation. Thus, with a pilot print of the subject alongside, one can restrict the inking or modify it in those parts of the image which need subordination, or heighten the effect where this is desirable. It is, of course, impossible to give definite rules here, where personal taste and feeling alone can guide the worker. But a few technical directions as to controlling the image and in manipulating the ink and brush action may be attempted. Thus the deposit of color and the obtaining of dark tones in the image result from slight swelling, and therefore from the use of lower temperatures in the soaking or swelling baths; from the use of thinner colors (i. e. hard colors thinned with Roberson's medium or soft inks); from softer brushes and the smooth operating of the brush without stippling; from the use of hardened papers and a smaller amount of acid in the bleaching bath. Similarly, the capacity of the image to "take" the colors or ink is diminished, and the picture given a brighter tone, by the use of a stiffer brush or rollers; by obtaining a higher relief or swelling, following the use of high temperatures in the soaking operations; by the use of harder inks; by a vigorous stippling brush action in pigmenting; by more vigorous treatment with the wet cotton wadding; or by light and very rapid movement in the use of the roller.

The Variable Factor. It is here seen that the variable factor is the differential swelling of the coating of the print, on which so much of the after results depend. The means selected to obtain the effects desired must depend on the artistic sense of the worker and his mastery of the flexibility of the process. The same sheet of paper might be made to give ten different pictures, though all from one and the same negative, in the hands of ten different workers. One might produce a print deep in color but with little contrast or brilliancy, another would give us a hazy or soft transcript of the same subject. The differences would be the direct result of the individual worker's use or control of the factors mentioned above.

Thus far we have spoken of the use of the brush in pigmenting the bromoil. We will now outline the method of using the roller in place of the brush, a variation much favored by European bromoilists.

Using the Roller. The roller employed in bromoil work has already been described. Its use offers the advantages of speed in production and the obtaining of fine-grained prints, but it does not lend itself to local control or individual expression as fully as does the brush. Those who seek to reproduce the original print in facsimile, however, will find the roller a better tool than the brush.

In the use of the roller the bleached print, with a minimum of relief or swelling, i. e. such as will not respond to brush treatment, is first colored or inked up with a large brush. This will not produce a recognizable image as the print has insufficient relief, but it serves to provide an even coating of color. The clean roller is now passed over the print with a medium pressure. After a few passes the whole of the picture suddenly appears in light tones. If this does not occur, the print should be removed from the pigmenting pad and immersed in warm water at 80° to 100° Fahr. to swell the untanned image. After 5 minutes it is replaced on the pigmenting support, carefully dried with cloth or chamois, again inked with the large brush lightly charged with ink, and rolled with the clean roller as before until the image is built up to the desired depth of color.

Or the ink can be thinly spread upon a large piece of glass, about 8 x 10, and the roller inked by rolling it back and forth over the inked surface of the palette, as in lithography, so that it has an even distribution of the color. The print is now gone over with the inked roller until the picture-image is built up. Slow rolling with moderate pressure brings out the image and gives it good color and richness; quick rolling with a light pressure diminishes the coloring of the print.

Grain. Art work can be done with the roller after considerable practice and those expert in its use have produced beautiful prints. The roller gives a finer grain in the image than the brush, and this tends to richness in detail and depth. This is probably the result of a finer division of the color by the roller than is obtained with the brush. A very pleasing coarse grain effect can be produced if the print is well swollen and then fairly fully inked with the brush. The color is now washed off with benzine and the print gone over with a wet roller. In this method either the roller is wetted or water is poured over the face of the print, with the result that the print is worked up with a mixture of benzine, water and color. After a few passes of the roller and this mixture, a very coarse grained image of characteristic beauty is obtained. The method is adapted for large prints and broad effects.

Drying the Print. When the pigmenting of the bromoil is completed it is firmly pinned down on a clean board and set vertically to dry in a place absolutely free from dust. Necessarily, as the picture-image is formed of an oily pigment, the bromoil dries very slowly. Perhaps after two days drying it may be hard enough for retouching or spotting if these are needed or desired. But in damp or rainy weather the print will or may take a week or two to become thoroughly dry. Banfield speaks of as long a time as three months being necessary in some cases, even under ordinary atmospheric conditions; but he has constructed a low temperature drying chamber (oven) in which his prints, suspended vertically at a temperature of 100° Fahr. dry thoroughly within three days.

Retouching. As soon as the finished print is surface hardened, any retouching, spotting or hand work needed may be started. If the print, for example, is too heavy in tone, i. e. shows too little contrast, the dry picture is wiped over with well wetted cotton wadding. This will brighten up the whole surface and bring out individual lights. Some practice is needed here, but the method is practical and produces results. If this or other after manipulation spoils the print, it may be soaked in water and all the old inking or color washed off with benzine or carbon tetrachloride ($C.C1_4$) or carbona, and re-inked just as before.

For smoothing out irregularities, working out undesirable light details, and the darkening of local portions, the retouching brush is wetted with benzine and on it, thus moistened, is taken a small quantity of the color used in pigmenting the print. This is worked a little on a piece of waste glass or other palette and then applied to the print, care being taken that the brush is always moistened with the benzine (which evaporates rapidly) and not allowed to get dry.

Dark spots in the print, or portions too dark in tone, may be reduced or removed with a piece of soft india rubber. This is also used for lightly tipping the edges of cloud forms when a sky has been added to a landscape or view in the pigmenting, or for giving an accent in the highlights of the picture. Of course, work of this sort demands an amount of skill and feeling, and must be done with due care. For softening harsh contrasts the ball of the finger rubbed on the print, when it is well hardened but not quite dry, will accomplish wonders. A retouching pen or small etching blade is used for removing hairs or small patches of pigment, grit, etc. from the face of the print. Sometimes these can be rubbed off with a touch of the ball of the finger. By one or other or all of these means the too-light portions may be darkened and the too-dark portions may be lightened in tone; lines softened; obtrusive details suppressed and the whole picture improved.

De-fatting. The oil-pigments used in making bromoils are technically known as "fatty inks." As a result the finished print exhibits a somewhat greasy or semi-glazed appearance. An interesting but little used process may be employed to remove this grease and give the surface of the print a different character. The dry print is put into a clean, dry tray and benzine or carbon tetrachloride is poured over it. After a few rockings of the tray, care being exercised not to touch the surface of the print, the print is removed and dried by suspending it (with clamped ends) in a dry place away from dust. The print, after drying, can be treated with wet cotton, as already advised, if increased contrasts are desired; but this operation now needs the greatest care as the treated print is much more sensitive to water than before. Retouching, with such a print, is done with a brush and water colors or pastel; broad light effects are obtained with a soft rubber eraser, highlights are cleared or accented with pointed hard rubber or knife. Or the de-fatted print can be cleaned up or brightened generally by the skillful use of a broad piece of soft rubber applied over the whole of the picture. Care and a light touch are essential here.

Cleaning the Brush. The brushes or rollers used in pigmenting may be washed out in benzine, carbon tetrachloride (English bromoilists use petrol), or soap and water. Rollers are easily cleansed by rolling over a plate of clean glass on which benzine is poured. But if bromoils are being pigmented daily it is not advisable to wash the brushes or rollers every day, as a brush without oiliness seems to dirty the print. After washing out, the brushes are best dried by strokes on linen or smooth paper. Both brushes and rollers should be dried in the open air before being used again as any benzine retained in the moist brush will dilute the color at the next inking.

Mounting the Print. Bromoils, being usually made on thick or heavy bromide paper, are not the easiest of prints to mount, especially if they have acquired a slight curl in drying. It is essential that the prints be thoroughly dry and hard. In this condition dry mounting is practicable and perhaps the best method. Or the back of the print is touched with fish glue along the four edges, about an eighth of an inch from the edges, placed on the mount, covered with a glass plate, which is then loaded or weighted and left until the glue is dry. For prints in black or warm black tones a "natural white" mount gives the best effect; for prints in sepia or warmer tones a cream or India-tinted stock may be desirable.

Bromoil Transfers

The highest development of the bromoil process is reached in the production of bromoil transfers, in which, by a simple, mechanical transfer from the bromoil print to another sheet of paper, or any other material which will take the oil color or ink which forms the bromoil image, we obtain a print in pure pigment. This method offers many advantages. The bromoil print serves as a printing plate, as in the photogravure process, and as many as six transfer prints can be obtained from it without the impairment or destruction of the original bromoil. Any kind of paper may be chosen for the support of the transfer, e. g. heavy drawing or cover papers or cardboard (white, cream or tinted) for poster or large portrait work, plate papers, thin Japan tissues or parchments, ordinary writing or ledger papers, and textiles such as silks, etc., so that we can perfectly control the surface texture and ground color of the final picture and get away from the gelatine surfaced papers so generally used in photographic printing processes. It is also possible to transfer the bromoil image to lithographic stone, by the use of litho transfer inks, which opens up the fascinating possibilities of bromoil-lithography. Finally, the bromoil transfer, when successful, gives perhaps the most desirable of prints for large pictorial or exhibition work as well as high class portraiture, approaching the photogravure print in surface texture, depth of color and tone gradation, with the ample margins which add so much to the interest of the fine engraving or photogravure.

The Transfer Process does not present any considerable difficulties to one who has already mastered the more elusive and uncertain art of making a good bromoil print. Briefly outlined it is as follows: A freshly inked (wet) bromoil print is laid face down on a larger sheet of plate or other paper and passed, with pressure, through a roller press. Or the transfer may be pulled in the usual way in a copperplate or lithographic press (if either is available) instead of a roller press. In either case the pigment image is transferred to the new support, being, in fact, pressed into the fibres of the paper or other support, with the result that we get a facsimile reproduction of the bromoil print, reversed as to right and left, but presenting all the details and tonal values of the original print.

Let us look at the method in detail. If the reversal of the picture as regards right and left is objectionable, the bromide print used as the base in making the bromoil should be reversed. If, as is usual, this is an enlarged print, the reversal is very simply accomplished by placing the negative in the enlarger with the film facing the light instead of the other way as is customary.

The Bromoil Print prepared for transfer making should be one in which a well swollen image with fair relief has given a brilliant and somewhat contrasty print, i. e. a vigorous print, with fully inked shadows and clean highlights. Usually a soft ink is used in pigmenting such a bromoil, or the hard ink advised in earlier pages is very slightly thinned with a soft ink or Roberson's medium. After the pigmenting has been completed, the print should be well swabbed with the wet cotton wadding as previously advised to clean up the lights and brighten the shadows, and then surface dried as usual with the linen cloth or chamois.

The Paper chosen as the support for the transfer should be thoroughly and uniformly dampened previous to the actual transferring. This is usually done before starting to pigment the print, by placing the sheet of transfer paper between several thicknesses of wet blotting paper, with the excess wetness squeezed out, under light pressure, such as a sheet of glass, for about an hour. To avoid the cockling of the sheet during the dampening, it is well to remove the pressure a few minutes after its first application in order to allow the dampened paper to expand evenly, after which the pressure is renewed. Another method of evenly dampening the transfer paper is to immerse the sheet in clean water for a few seconds, passing a wad of wetted cotton over the surface to remove any airbells; then blot the sheet lightly all over and place it between two thicknesses of dry blotter and pass it once through the roller press employed for the transferring. Different kinds of paper call for different treatment in this dampening or conditioning, the object being to get a uniformly dampened sheet. Some fine matt surfaced papers will give a good transfer without dampening and, for small transfers, many workers prefer to use a dry instead of a dampened paper.

The Press. As indicated a press of some kind is necessary for the making of these bromoil transfers, although I have read of successful small transfers being obtained by hand pressure and the skillful use of a smooth ivory rubbing tool. Good transfers have also been obtained with an ordinary letter copying press, but some form of roller press is generally employed and special presses are provided by Sinclair, of London. Any good roller press will serve, provided that its two rollers are capable of giving an even pressure over the whole of the print when it is put through in contact with the transfer paper. Fred Judge, whose bromoil transfers have delighted the world, used in his earlier work the home mangle or domestic clothes wringer, with its ancient, wooden rollers and central screw pressure. The old-time photographer's burnishing press will serve in a pinch; but one fitted with rubber rollers would be preferable. A copperplate press is also excellent for the purpose and, where available, a lithographic press gives beautiful transfers. In this last case, the wet bromoil print is placed, face up, on the litho stone bed and the transfer paper over the print, with the usual rubber blanket over all before the pressure is applied. The uniform and ample pressure given by the litho press is greater at every part of the print than that obtainable in the roller press, so that a perfect transfer is obtained at one operation. In the use of the roller press, if the first transfer does not give as rich and "juicy" a print as the original bromoil, it is necessary to re-ink the bromoil and make a second transfer, with due care to secure registration in the print before making the second transfer.

A new method of making bromoil transfers, which is an adaptation of the rubber off-set process of printing half-tone blocks, in which a specially devised press is employed, is described by James Rowatt in the February 1922 issue of *The Club Photographer*.

Making the Transfer. Presuming the use of a roller press we need the following accessories: Two sheets of heavy cardboard (or better, two sheets of smooth zinc or metal) twice as long as the longest way of the print and as wide as will pass easily through the press; a few sheets of lintless blotting paper; and a piece of printer's blanket or thick baize larger than the print being transferred.

The bromoil print intended for transfer is supposed to have a clean margin around the pigmented image as a safe edge. After the print is inked up, this margin is wiped clean with a wet rag so as to obtain a clean, straight edge around the picture, and the print is trimmed with a sharp knife or razor blade to provide a margin of ¼ inch with perfectly sharp cut corners.

The sheet of dampened paper is now laid down on one of the cardboard or zinc sheets. The wet bromoil is next laid, face downward, on the sheet of dampened paper, carefully positioned to give the desired margins. Over the bromoil print is placed a sheet of dry blotting paper. This is to absorb the moisture pressed out from the bromoil during the transfer. Over the blotter is placed the printer's blanket and over all the second cardboard or zinc sheet. The whole "sandwich" is now passed twice through the press, that is, once through and back, with a steady, continuous motion and even pressure.

Remove the top layers of the "sandwich," put a fine pencil mark at each corner of the bromoil on the transfer sheet for registration purposes, and carefully strip or peel the bromoil from the transfer support, placing it in a tray of clean water.

Examine the transfer print. If all has gone well it will present a thinly inked but perfect reproduction of the bromoil, lacking, perhaps, sufficient depth of color in the shadows of the subject, but fully detailed, with clear highlights. The required depth or fulness of coloring is supplied by a second or third transfer if needed.

Multiple Transfer. For the second or third transfers the operations described are repeated step by step. Thus the bromoil print is taken from the water, surface dried with the linen cloth or chamois on the pigmenting pad and re-inked with a hard ink. It will usually take the ink more readily after transfer than in the original or first pigmenting and the re-inking will not occupy more than a few minutes. In this re-inking for the second transfer work for rich, juicy shadows and full contrasts throughout the whole of the print. After inking swab the print with the wet cotton wadding to clear the lights and increase the general brilliancy. Dry with the linen cloth or chamois as before and repeat the transfer operation, using the pencil marks on the transfer paper to secure correct registration before passing the "sandwich" through the press.

Usually, this second transfer will give the print the depth and richness of coloring and effect desired. If however, it is judged to lack quality in any part, this can be remedied by a third transfer. For this the print is again wetted, dried on the pigmenting support as before and re-inked only in those parts where the transfer is judged to lack force or color, after which the third transfer is made as before. These transfer operations, by the way, are extremely interesting and far less tedious or involved in the doing than in the description of the procedure.

It will be obvious that this multiple transfer method offers many possibilities for modification and the introduction of pictorial effects by the variation of the re-inkings. When skillfully handled the transfers far surpass the original bromoil in surface effects, richness of color and tone gradation. The transfer, however, does not exhibit its full effect immediately after coming from the press, the color of the print, its brilliancy and depth of tones gaining in quality as the print dries. As the image is in rather than on the paper, and since this is not gelatinized, the bromoil transfer dries more quickly than the bromoil. Like the engraving or photogravure, its permanency is limited only by the quality of the paper and ink used. If the inks are "fast color" and free from anilines and a pure "all rag" paper is used, the bromoil transfer will retain its good qualities indefinitely and improve with age.

Number of Transfers. Properly handled a single bromoil will yield half a dozen transfers without deterioration, this depending on the character of the bromide paper base and the resistance of the relief image in the bromoil. Herz says that he has obtained as many as twenty transfers from a single bromoil, but this is exceptional. As soon as signs of wear and tear or deterioration are visible in the bromoil, all transferring should be stopped. When this happens, the bromoil may be wetted, dried and re-inked and serve as a perfectly good bromoil in addition to the transfers obtained from it. Those who make bromoils simply as a means of obtaining transfers, however, wash the print off with benzine as soon as the transfer is made. This restores it to its original condition as a bleached bromide ready for re-pigmenting at any future time either for transferring or as a simple bromoil.

The Retouching of Transfers is confined to brush work with watercolors for the spotting of defects or deepening of shadows, and the use of rubber erasers or an etching tool in the lighter portions of the print. Obviously, also, it is possible to work up transfer prints, where this is desirable, with suitable chalks, crayons or pastel. But the appeal of the bromoil transfer lies chiefly in its quality as a black and white print and the few colored bromoil transfers I have seen have not compared favorably with the monochrome print.

Bromoils in Color. For the sake of completeness, rather than from any desire to urge the reader into perilous adventures, the concluding note of this little book may mention the possibility of making bromoils, and even bromoil transfers, in color. This is not merely a possibility. Multicolor bromoils and transfers in color have been shown at European exhibitions in past years.

For the production of successful work of this sort a a practical knowledge of colors and their handling, such as painters in oils and watercolors possess, is, of course, as essential as a considerable ability in the ordinary bromoil process. Patience and a practised dexterity in brush work are other prime requisites.

As far as apparatus and materials go, those advised for monochrome bromoil work will serve for polychrome printing. The best bromide print for this purpose is one fully developed, with fairly strong contrasts and marked gradation, but varying in general character according to the subject as to scale of tones etc. For guidance in pigmenting it is advised to have a pilot print of the subject at hand, with color notes, or a water color sketch if this can be provided. It is also recommended that the image be not entirely bleached out, but removed from the bleaching solution when it reaches a light tan color, this providing a guide in applying the color pigments and giving a desirably warm undertone to the print.

As for the pigments or inks employed, the permutations and combinations of color schemes are so variable and numerous that it is difficult to lay down any hard and fast rules. A. H. Dodman says: I get almost any shade of color desired by mixing the so-called primaries—red, yellow and blue—with sepia and black to help out the shadows. J. L. Tucker, in *The Amateur Photographer* of June 17, 1912, says: In the first stage of inking up, use the primaries—yellow, blue, and red only—and get the picture out in these, keeping it as pure as possible; mix a little white with the blue if too strong in tone. Then proceed with the secondary colors—green, purple, orange—still keeping all rich and pure—put the colors on in patches, using always a large brush, and blend and mix them till they give broken tints. Burnt umber is a very useful color, especially for warming greens, or mixed with a tiny quantity of black for the trunks, etc. A beautiful warm grey can be made with this color; a little blue and white for a cool grey black and white; and a still colder grey is obtained by adding a small quantity of blue. It is best to test the color either on the print itself, or on a piece of spare paper, and then modify the print as required.

Where a subject is such as a grey day, a good plan is to mix up a medium tint of this color, and go all over the print with it, modifying it afterwards with transparent colors. and finishing up with sepia or black for the deepest shadows. Black, however, should be used very sparingly, as it soon destroys brilliancy. As the print nears completion look at it from a suitable distance. It will almost invariably be found that certain highlights, such as leaves of trees that have caught the light, bits of sky through the trees, patches of light on a road.

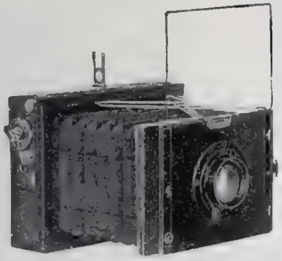
etc., are too prominent, and irritate the eye; they can be subdued with color made to match the surroundings, and diluted with medium. Highlights that have lost their brilliancy can be lightened with a suitable size brush moistened in benzine, with the excess removed by a hopping action. Shadows that are clogged may be cleared in same way, using a larger brush.

After the print is quite dry it is easy to modify objectionable features or tones, and increase the richness by adding carefully transparent color charged with medium; a piece of ink-eraser, sharpened to a point, is useful for increasing highlights.

Polychrome Transfers. When the bromoil in color is intended for transfer, C. F. Stuart advises a fully exposed bromide print with a long tone scale and without excessive contrasts, on a "soft" paper which will take the pigments easily. He uses "soft" inks or pigments, such as copperplate inks or tube oil colors in place of the stiffer lithographic inks, and carries the pigmenting of the print through as rapidly as possible. When the inking is completed the transfer is made as already described for monochrome work, but the transfer paper is used dry, not dampened, and slightly rough papers, such as Whatman, etc. are recommended as taking the colors well in the transfer. In this operation strong pressure is employed, with hard wood rollers in the press, to secure a full color transfer in two passages through the press, i. e. through and back, without subsequent re-inking and re-transfer.

NOTE

The special brushes, inks and other imported materials needed for bromoil work can be obtained from the following dealers: Abe Cohen's Exchange, Inc.; George Murphy, Inc.; J. L. Lewis (New York); Ralph Harris & Co. (Boston); and Hirsch & Kaye (San Francisco). The only handbook to the process available in English is Sinclair's "Bromoil and Oil Prints: How to Make Them. Sixth Edition 1920, $1. Tennant and Ward, New York.



Contessa-Nettel

DECKRULLO -NETTEL

The Finest Focal-Plane Camera Extant for

Athletics, Sports, Home Portraiture News Work, Wide Angle Views

Incorporating the Unique Features

Focal Plane Shutter: Self-capping; watch-like precision yet remarkably sturdy; speeds up to 1-2800th second in 9x12 cm. and larger sizes; not affected by climatic changes.

Lens: Carl Zeiss, Series Ic *f*/4.5 anastigmat.

Focusing even when camera is closed.

Scissors Struts for extending the front, the most rigid method possible, permitting lenses of short or long focus to be interchanged.

Models: In leather covered or Teakwood of the finest quality and appearance in the following sizes:

6½ x 9 cm	9 x 12 cm	10 x 15 cm	13 x 18 cm
(2½ x 3½ in.)	(3¼ x 4¼ in.)	(3¼ x 5½ in.) (4 x 6 in.)	(5⅛ x 7⅛ in.)

G. GENNERT, ***Distributor***

HAUFF PRODUCTS

The Aladdin's Lamp of Photography Open New Possibilities

ORTOL—The best negative developer **GLYCIN**—For line work

and now **NEOL**—The new "Wonder" developer

Overexposure corrected. Halation overcome. Direct sepia development prints.

HAUFF'S DRY PLATES—A grade for every purpose; all excellent

"Extra Rapid"—Fastest of all rapid plates

G. GENNERT, ***Distributor***

NEW YORK
24-26
East 13th St.

CHICAGO
139-141
N. Wabash Ave.

LOS ANGELES
206-208
So. Spring St.

SEATTLE
2102
First Ave.

An Unusually Interesting Book on the Art Side of Photography

Pictorial Landscape Photography

By the

Photo Pictorialists of Buffalo

A series of illustrated papers by members of this famous group, giving their theory of landscape photography, their methods of work in the field and technical equipment; the production of negatives, prints and enlargements—with formulas. Reprinted, with changes, from "American Photography," with two new chapters on gum printing.

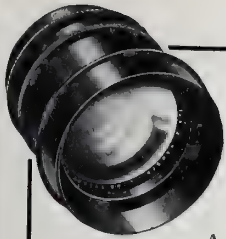
The Titles of the Chapters Follow:

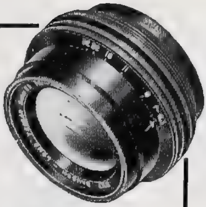
1. Pictorial Landscape Photography; Its Nature and Scope. 2. Some Notes on Equipment; Size; On Lenses; The Camera; A Useful Accessory. 3. On Field Tactics; Where and When; On the Spot; On Technique. 4. The Negative and Its Enlargement. 5. Modification of the Negative. 6. Carbon and Other Printing Processes. 7. Carbon Printing; Preparation of the Transfer Paper; Sensitizing the Tissue; Printing; Development. 8. The Presentation of the Print. Appendix A. The Color of the Print. Appendix B. The Advantages of Small Groups of Workers. Appendix C. Multiple Gum Printing, by Paul Lewis Anderson. Appendix D. Gum-Bromide Printing, by William S. Davis.

252 pages; 53 plates;
bound in red cloth, $3.50

Sent postfree on receipt of the price, by

Tennant and Ward
103 Park Avenue, New York





Prices Down Again!

Another price reduction—amounting to nearly 20% this time—is announced in the complete line of

BAUSCH & LOMB TESSARS and PROTARS

The quality of these famous anastigmat lenses is on the same unvaryingly high plane as ever, but the prices are now back, in many numbers, nearly to their pre-war basis. While this reduction is scarcely yet warranted by production costs, we are glad to make it at this time in order to strengthen and stabilize the American market for these highest grade, American-made lenses.

This applies to our well-known Tessar Ic, (F: 4.5), matchless speed lens for reflecting cameras; Tessar IIb (F:6.3), all-round anastigmat for hand cameras; Protar VIIa, truly convertible lens for the serious amateur and the commercial photographer; and Protars IV and V, standard wide angle lenses.

Write for our new price list—and booklet, "What Lens Shall I Buy?", if you haven't already received a copy.

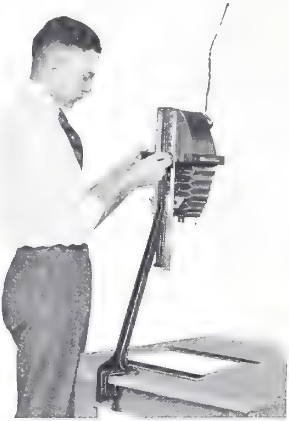
Bausch & Lomb Optical Co.

634 St. Paul Street, Rochester, N. Y.

New York **Chicago** **Washington** **San Francisco**

Leading American Makers of Photographic Lenses, Microscopes, Projection Apparatus (Balopticons), Ophthalmic Lenses and Instruments, Photomicrographic Apparatus, Range Finders and Gun Sights for Army and Navy, Searchlight Reflectors, Stereo-Prism Binoculars, Magnifiers and other High-grade Optical Products.

A New Enlarger



Kodak Auto-Focus Enlarger

Amateur apparatus that eliminates focusing in enlarging. Makes prints on Bromide paper from 1½ to 3½ times the dimensions of any size negative up to 4 x 6

The Kodak Auto-Focus Enlarger changes enlarging into a printing process almost as rapid and easy as contact printing.

As you slide the camera up or down on its standard—it clamps to any table top and operates vertically—the image shrinks or grows to the size desired but always remains critically sharp. The mechanically accurate, auto-focus device automatically changes the adjustment of the camera lens and constantly keeps the image in sharp focus.

The apparatus is complete with electric cord and plug, negative holder, paper holder, set of flexible masks in six sizes and Kodak Anastigmat Lens, but without the 60 Watt Mazda Lamp required for illumination.

Kodak Auto-Focus Enlarger	$35.00
Diffusing Disc for soft focus prints	1.00

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

At your dealer's

For all enlarging, including printing with the Kodak Auto-Focus Enlarger, use—

EASTMAN BROMIDE PAPERS

Emphatically faster than other developing papers—as easy to use as Velox.

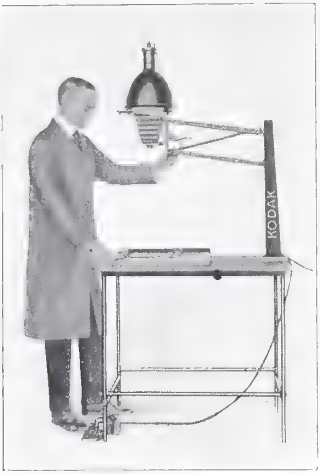
Velvet Bromide for enlargements from average negatives—negatives that make good contact prints on Special Velox.

Brilliant Velvet Bromide for negatives that make good contact prints on Regular Velox.

Royal Bromide for re-development for sepia effects.

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

At Kodak dealers'



Kodak Projection Printer

An instrument that simplifies the making of large prints from small negatives

THE Kodak Projection Printer is not merely an improved piece of apparatus. It embodies an entirely new idea—revolutionizes enlarging and changes it into a simple printing process—projection printing.

The idea is based on the scientific and mechanical accuracy of the instrument itself, and the process is simple and easy.

The image is always in focus—move the camera up or down and the image expands or shrinks but always remains hair sharp, so accurate is the automatic focusing mechanism.

The Printer will take negatives 3¼ x 5½, 4 x 5 or smaller and will make prints up to 24 x 32 inches.

Kodak Projection Printer, complete with Kodak Projection Anastigmat Lens *f.* 6. 3 and 100 Watt Stereopticon Mazda Lamp, is priced at $200.00.

Send for booklet "Printing with the Kodak Projection Printer"

EASTMAN KODAK COMPANY
ROCHESTER, N. Y., *The Kodak City*

A paper for better portrait prints

All of the delicate gradation—all of the richness of tone—all of the roundness and depth of the ideal portrait enlargement are secured in the print on

EASTMAN
PORTRAIT BROMIDE

Rich black tones by straight development—beautiful carbon-brown, sepia tones by re-development. Supplied in two colors of stock and two surfaces.

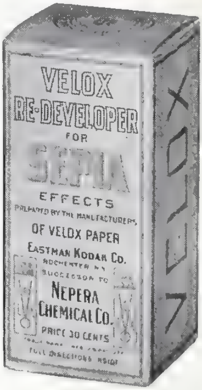
D White Rough Matte
D White Rough Lustre
E Buff Rough Matte
E Buff Rough Lustre

At prices the same as for D. W. Artura Iris

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

Sepia-toned prints are easily secured with



Velox Re-Developer

The original black and white print emerges from the re-developer a rich, warm brown—a particularly happy tint for landscapes and portraits.

Velox Re-Developer is put up in two forms—bottle and tube. The four ounce bottle will tone approximately 75 8 x 10 size prints or their equivalent—each of the tubes, which may be purchased separately or in cartons of twelve, will re-develop about one dozen 8 x 10 size prints.

The Price

Velox Re-Developer, per 4 ounce bottle	$ .50
Ditto, 2 ounces	.30
Velox Re-Developer Tubes, per package 12 tubes	.84

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

At your dealer's

DALLMEYER
ESTABLISHED
LENSES 1860 CAMERAS
LONDON

Just as the sun rises and pursues its way unfalteringly to sunset, so can

DALLMEYER LENSES

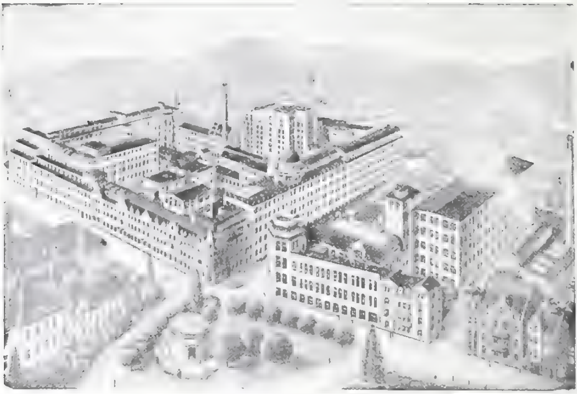
be trusted to give perfect pictures with the same regularity, and perform the several photographic tasks each type is designed to accomplish.

Their reputation has been built up on the fact that they answer the extreme needs of the photographic worker.

The lens is the most important part of the photographic outfit, so, if the lens is good your photographs will be good.

Ask your dealer for the Dallmeyer catalogue. It is full of interesting information about every type of lens we make. Dallmeyer lenses can be ordered through all reputable dealers. If your dealer cannot supply the new catalogue, we will send it with pleasure on request.

J. H. DALLMEYER LTD
CHURCH END WORKS. HIGH ROAD.
WILLESDEN, LONDON N.W.10.



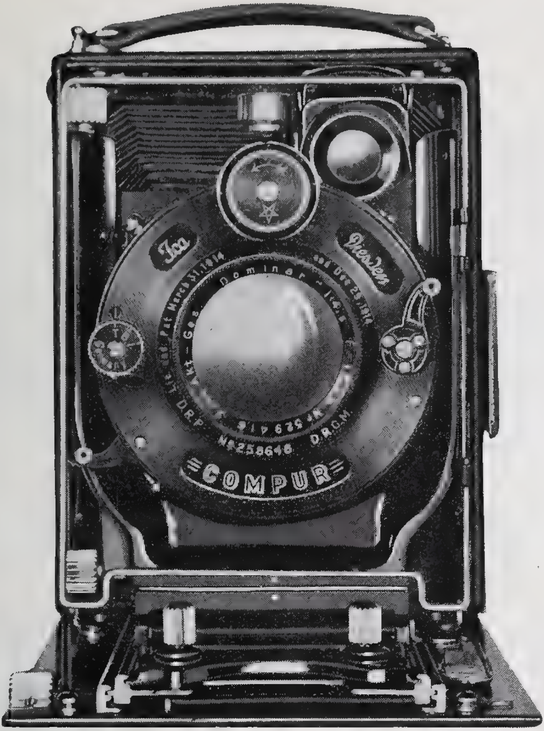
CARL ZEISS
JENA

CARL ZEISS PHOTOGRAPHIC LENSES are the exclusive product of the world renowned Zeiss works at Jena, famous as the birthplace of the modern anastigmat.

Zeiss standards of scientific construction and optical accuracy make it impossible to offer Zeiss objectives at prices competitive with photographic lenses of unequal quality.

If supreme photographic excellence, unequalled definition, and flatness of field, with maximum illumination are your requirements, your next lens must necessarily be a Carl Zeiss.

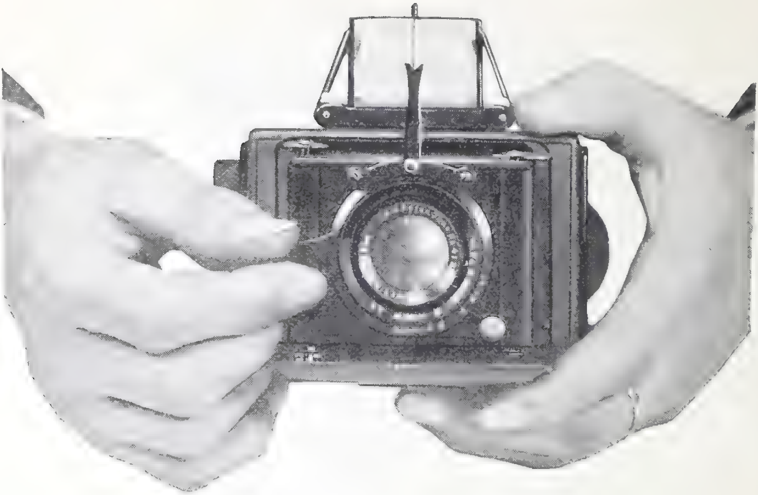
Harold M. Bennett
U. S. AGENT
153 West 23rd Street New York



The Ideal B fitted with the DOMINAR LENS, *f*/4.5

The Dominar is a new Ica Anastigmat, an *f*/4.5 lens that will appeal to the most discriminating, yet moderate in price. It is just the kind of a lens you would expect of Ica. Most of the Ica Cameras can now be had with Dominar lenses.

Harold M. Bennett
U. S. AGENT
153 West 23rd Street New York



ERNEMANN

Miniature Focal Plane

The finest hand camera in the world

For the vest pocket. Built with watch-like precision; simple and unfailingly accurate in use; combines the utmost in range and efficiency within the smallest compass. For plates or film pack 1⅝ x 2½.

Equipped with a Carl Zeiss f. 3.5 lens; large direct view finder and focal-plane shutter with 48 speeds, from Time and Bulb to 1-1000th of a second. Hooded focusing screen; 3 single metal plate holders; film pack adapter and leather carrying case. Gives diamond clear negatives yielding perfect enlargements.

Prices according to lens equipment, from $100 to $140
Send for Illustrated Leaflet today

HERBERT & HUESGEN COMPANY
18 East 42nd Street, New York City

Wall's Dictionary of Photography

and Reference Book for Photographers

Tenth Edition
Re-written and Enlarged by
F. J. MORTIMER

700 pages : 2000 references
A library in one volume

Price $5 Postfree

Photography Made Easy

As Easy as A-B-C

By R. CHILD BAYLEY

The best guide for beginners. Covers all branches of every-day photography with practical instruction in plain language. A mine of helpful information.

261 closely printed pages
Strong paper covers

Price $1.50 Postfree

Ready for delivery in May

Wall's Photography in Colors

The latest and most complete account of all processes. An indispensable book.

Price $3 Postfree

TENNANT AND WARD
103 PARK AVE., NEW YORK

GOERZ

Lenses and Cameras

WHATEVER branch of photography interests you most, you will find in the Goerz line just the camera or lens needed to help you realize the best results with your work.

The Dogmar, Dagor or Tenastigmat lenses fulfill all requirements for speed, outdoor or indoor use, portraiture, long or short focus, etc. The rollfilm or plate Tenax, Long-Focus Taro, High-Speed Ango, or Goerz Stereo cameras afford a choice of model that will meet all ordinary requirements.

Ask your dealer to let you see these lenses and cameras, or write

C. P. Goerz American Optical Co.
317F East 34th Street, New York City

Makers and importers of photographic, optical and scientific instruments

Goerz Lenses:

DAGOR F/6.8
The universal lens

DOGMAR F/4.5
The ultimate high-speed lens

Goerz Cameras:

ROLLFILM TENAX
Light and compact
1⅝ x 2½
2¼ x 3¼
3¼ x 4¼

PLATE TENAX
Extremely light and small but for finest work
1¾ x 2⅜
2½ x 3½
3¼ x 4¼
1¾ x 4¼ (stereo)

LONG FOCUS TARO
Compact folding camera
3¼ x 4¼
3¼ x 5½
10 x 15 cm.

HIGH SPEED ANGO
For experienced photographers
3¼ x 4¼
4 x 5, 10 x 15 cm.
5 x 7

STEREO
Light and compact. Two pictures on 1¾ x 4¼ plate . . . The Ango is made in this style.

For the shortest days of the year use the longest plates in the market

HAMMER PLATES

are EXTRA LONG in speed, detail, color value and every quality that goes to make a perfect negative. Special brands for special needs.

Hammer's Special Extra-Fast (red label) and Extra-Fast (blue label) Plates for field and studio work, and Hammer's Extra-Fast Orthochromatic and D. C. Orthochromatic Plates for color-values.

HAMMER DRY PLATE CO

REG. TRADE MARK

HAMMER DRY-PLATE COMPANY
Ohio Avenue and Miami Street, ST. LOUIS, MISSOURI

PHOTO-ENGRAVERS' MACHINERY

JOHN ROYLE & SONS
PATERSON, N. J.

SMASHING REDUCTIONS

Send for Bargain List No. 25

NEW YORK CAMERA EXCHANGE
114 Fulton Street, New York

There is a profitable field of camera work for the amateur who can make really clever photographs of flowers, trees, gardens, etc., for the outdoor life and country magazines, farm papers, book publishers and for calendar use.

GET *and* READ

J. Horace McFarland's

PHOTOGRAPHING

FLOWERS AND TREES

The only handbook to this fascinating and profitable hobby—with a supplement on "Decorative Photography," showing how all natural forms are adapted for illustration purposes. Covers the subject completely, with detailed working methods from practical experience.

A gold mine book for those who can put it to work.

PROFUSELY ILLUSTRATED

93 pages, 73 illustrations
frontispiece in colors

Price 50 cents, post free

TENNANT & WARD
103 PARK AVE., NEW YORK

GRAF
SUPER LENSES

The Utmost in Quality

THE GRAF VARIABLE

Anastigmat and Soft Focus lens in one. Adjustable for diffusion without stopping down—from sharp to soft definition at full opening of the diaphragm.

No halo or run around
Wide open F:4.5

GRAF SUPER ANASTIGMAT

F:4.5 F:6.3 F:7.7

Send for Descriptive List and Announcement of the Cash Prize Competition for Users of Graf Lenses.

GRAF OPTICAL CO.
South Bend, Indiana

NEW YORK OFFICE
JOHN WALLACE GILLIES
80 West 40th St., New York
CHICAGO OFFICE
EUGENE HUTCHINSON
410 Michigan Ave., Chicago

GRAF
SUPER LENSES

The Monomethylparamidophenol Sulphate which is 100% pure is

METAGOL, "CIBA"

Made by the Society of Chemical Industry in Basle, Switzerland;
makers of standard chemicals since 1864.

AT YOUR DEALER'S OR WRITE US

Leading photographic paper-manufacturers are recommending and three-fourths of the motion-picture industry are using

METAGOL, "CIBA" and HYDROQUINONE "CIBA"

"There's a Reason"

TRADE MARK

REGISTERED

CIBA COMPANY, INC.

CEDAR AND WASHINGTON STREETS
NEW YORK CITY

The Simplest and Most Practical Course of Instruction in Retouching, Finishing and Coloring Methods. 90 pages, with 16 plates; 6 x 9 in., postfree, $2.50

The Art *of* Retouching Negatives *and* Finishing *and* Coloring Photographs

By ROBERT JOHNSON

Tenth Edition. Completely Rewritten, Enlarged and Profusely Illustrated by T. S. Bruce and A. Braithwaite

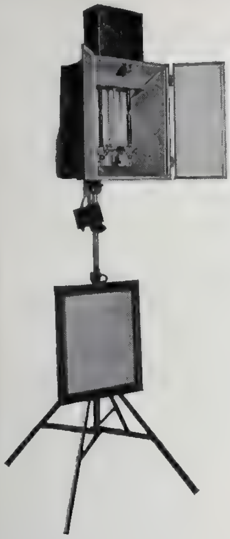
Part I. Negative Retouching.

Material for Negative Retouching. Position of Desk. Sharpening Pencils. Applying Medium, etc. Knife and "Negatake" Work. Position at desk. Correct Holding of Pencil. Best Touch for Beginners. What to Aim At. Varnishing. Double-Working. Modelling. General Remarks on Modelling. Hair and Dress. Foliage and Grass, Snow, Clouds and Water, Animals, Spotting, Stumping, Blocking Out, etc.

Part II. Finishing and Coloring Enlargements.

Working-up Enlargements in Monochrome. Powder Work. Cloudy Backgrounds. Vignetting. Brush Work. Treating the Hair, Eyes, etc. Small Work. Sketch Portraits. Using the Aerograph. B. & W. Work. Working in Water-Colors. Finishing in Oil-Colors, etc.

Tennant and Ward, 103 Park Avenue, New York



"WOHLITE"

A highly developed electric arc lamp adapted for use in either the studio or the home.

JUST AS ESSENTIAL TO THE PHOTOGRAPHER AS HIS CAMERA

Always dependable for instantaneous exposures of one quarter second or less. Has a double current range and

CAN BE USED ON EITHER DIRECT OR ALTERNATING CURRENT

without any change in connections

We make lamps for every photographic need. Send for Bulletins and further information.

Write for information now while thinking of it

M. J. WOHLE & CO., Inc.
Payntar Avenue and Hancock Street
LONG ISLAND CITY, N. Y., U. S. A.

ALDIS ANASTIGMAT F:3 LENSES F:3

Indisputably the Best

A New Formula assuring splendid definition or wonderful softness at will, with complete absence of ghost or flare.

Booklet on Request

AMERICAN AGENT
J. L. LEWIS
522 SIXTH AVE., NEW YORK

BARNET BROMIDE PAPERS

for enlargements of quality

Made in Several Grades
CREAM, CRAYON, ROUGH
is especially recommended for BROMOILS and Pictorial Work, both Portraits and Landscapes

Circular on Request

AMERICAN AGENT
J. L. LEWIS
522 SIXTH AVE., NEW YORK

METEOR
PHOTO CHEMICALS
JOHN G. MARSHALL
1752 Atlantic Avenue, Brooklyn, New York
CYNTOL (Metol)

RODINAL
Universal Concentrated Liquid Developer. Simply dilute 1-10 to 1-40 with water. Keeps indefinitely

GLYCIN
The Ideal Non-Staining Tank Developer and all other photo chemicals
SEND FOR CATALOG W.

The only practical method available today for obtaining
PHOTOGRAPHS IN COLORS
faithfully reproducing any subject in all its beauty of color is the use of
LUMIÈRE
AUTOCHROMES
Simple in Use Certain in Result

Send today for the Autochrome Handbook giving Formulas and Full Working Methods. FREE ON REQUEST

GRIFFIN PLATE DEVELOPING TANKS
Plates are put in in the darkroom, or in a changing bag, *and all other operations are carried out in the light.*

R. J. FITZSIMONS
U. S. Agent 75 Fifth Avenue, New York

PLATINOTYPE
[Pure Platinum]

PALLADIOTYPE
[Pure Palladium]

SATISTA
[Platinum and Silver]

The papers de luxe   Send for latest lists

WILLIS & CLEMENTS, 1814 Chestnut St., Philadelphia, Pa.

O.D.D. *What is it?*

AN OPTICAL DIVERGENCE DETERMINER

for hand cameras. A *scientific precision device* which adds to the hand camera all the distinctive advantages of the professional camera with ground glass focusing screen, viz: you get the full value of your lens as to the amount of subject included in the view, correct linear perspectives and perfect control of the spacing—foreground, middle, distance and sky, thus ensuring success in your picture making. Simple in use, effective in results, with less outlay —avoids waste.

Price $6. Send for descriptive leaflet to

A. FREEMAN PICTORIAL PHOTO AND MFG. CO.
Photo M.   **COLORADO SPRINGS, COLO.**

GLYPHOSCOPE—*Richard*

Stereo Photography at Small Cost

LATEST MODEL   **$15.00**

Possesses the fundamental qualities of the famous Richard Verascope

Write for information about any stereo apparatus

R. J. FITZSIMONS
U. S. Agent   **77 Fifth Avenue, New York**

A Boon to Pictorialists
A Revelation to the Beginner

SUCCESS or FAILURE
with your camera is PLAINLY VISIBLE thru

SCHEIBE'S MONOTONE FILTER

which shows you what you will get before clicking the shutter

Motion picture cameramen are enthusiastic about it

Price $3

At your dealers or from

GEORGE H. SCHEIBE
Photo Filter Specialist
701 NORTH BELMONT AVE.
LOS ANGELES, CAL.

The Photo-Miniature: No. 184

SOFT-FOCUS EFFECTS IN PHOTOGRAPHY

A plain statement of the common sense of the matter; with an account of all the soft-focus lenses, disks, screens and other diffusion devices; instructions in their use, with illustrations, and a few notes from the experience of prominent photographers who use them.

Price 40 cents

At Your Dealers

TENNANT AND WARD
Publishers
103 Park Avenue New York

Everything worth while has its imitators and competitors. But no one has yet produced an air brush to equal the

WALKUP AIR BRUSH

for obtaining the artistic effects and fine detail work required by the photographer. That's why experts who have used it over 20 years still prefer and use the Walkup Air Brush. Made at Rockford, Illinois, under the supervision of the original inventor and patentee, Liberty Walkup. Send for unsolicited testimonials of users.

Buy the right air brush

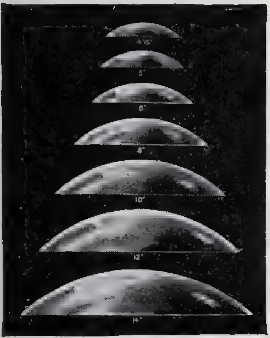
AIR BRUSH MFG. CO., Rockford, Ill.

Our Booklet of Soft Focus Lenses,
Written and illustrated by five famous pictorialists will be sent you free on request. It describes the

SMITH "SYNTHETIC"
and other SOFT FOCUS LENSES
also the new WOLFE "ARTISTIC"

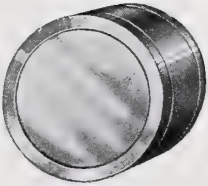
which converts the lens on your camera into a soft focus lens at will—without any change of focus scale, etc.

PINKHAM & SMITH COMPANY
Two Stores **292 Boylston Street** **13 Bromfield Street** **Boston, Mass.**



IMPORTED CONDENSERS
All diameters and focal lengths

Imported French
PHOTOGRAPHIC
CONDENSERS
for Enlarging and Reducing



SPECIAL OFFER

4 in. diameter mounted in metal, per pair	**$2.75**
4½ in. " " " "	**3.00**
7 " " " " "	**10.00**
8 " " " " "	**15.00**
12 " " " " "	**37.50**

J. H. B. DONALDSON ENTERPRISES
Dept. E, 1591-1597 BROADWAY, NEW YORK CITY

Let us supply your photographic needs
We carry full and ample stocks of

HAND, VIEW AND STUDIO CAMERAS
LENSES—ALL KINDS AND MAKES

Printers—Enlargers—Washers—Driers
ARTIFICIAL LIGHT EQUIPMENTS

EVERYTHING PHOTOGRAPHIC

Send for New Lists ***Let us quote prices***

GEORGE MURPHY INC., 57 East 9th Street, NEW YORK

The photographic book market has not yet got "back to normalcy" and there are few books to be had—none at all on many subjects. *But our*

MONTHLY BOOK LIST

includes almost all the "worth while" books at present obtainable on the different branches of photographic work. Tell us what you want to know and we will advise you of the best books for your need, sending you the list at the same time.

TENNANT AND WARD
Publishers and Importers
103 PARK AVE., NEW YORK

QUALITY LENSES
AT
MODERATE PRICES

Wollensak products are sold on a basis of quality, not of competitive price. The fact that prices are lower than others testifies to our efficient production methods. It is a pleasure to be able to offer such fine equipment at the reasonable prices prevailing, but we invite your comparison particularly with reference to genuine merit rather than price alone.

Ask for our latest price list and descriptive literature.

WOLLENSAK OPTICAL CO.
Rochester, N. Y.

Air Brush Colours
WINSOR & NEWTON'S
"Winchester Aerograph" Colours
Suitable for Decorative Designing, Illustration, Etc.
Water colours for miniature painting. Transparent oil colours for colouring photographs and lantern slides.

Everything for the Artist
Send for Colour Chart and Circular M-2
"Common Causes of Air Brush Failures"

WINSOR & NEWTON, Inc., 31 East 17th St., New York

Chemically Pure, Non-Linting, Durable, Economical
FOR EVERY PHOTOGRAPHIC PURPOSE
"PHOTO FINISH WORLD"
BLOTTER IS THE BEST IN THE WORLD
INSIST ON "PHOTO FINISH WORLD." YOUR DEALER HAS IT
Write Us For Working Sample
THE ALBEMARLE PAPER MFG. CO., RICHMOND, VA., U. S. A.

The amateur who seeks an ideal process for the making of his exhibition prints, and the professional seeking a new and distinctive printing method should get and read

THE PHOTO-MINIATURE: No. 185

KALLITYPE

AND ALLIED PROCESSES

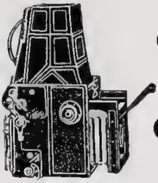
A comprehensive and practical handbook, giving working methods and formulas for the preparation of plain silver prints (black or brown tones) on art papers; silver-platinum prints; platinotype on special papers, copper, uranium and blue prints.

PRICE 40 CENTS

At your dealers, or from

TENNANT AND WARD

103 Park Ave. New York, N. Y.



GRAFLEX
KODAKS
CAMERAS
AT REAL

BARGAINS

Trade your old camera to BASS for a new one

Get your name on the BASS MAILING LIST NOW

BASS CAMERA CO.

Dept. M, 109 N. Dearborn Street
CHICAGO

N. B.—THE BASS STOCKS OF MOTION PICTURE APPARATUS ARE THE WORLD'S LARGEST.

JUST OUT

OUR LATEST

Bargain Book
and CATALOG

Send at once for your copy and you will be convinced that we can save you money and give you satisfaction. We have pleased thousands. You will find hundreds of used and new Cameras, Kodaks, Lenses, and supplies of every description listed at remarkably low prices. Every item sold is guaranteed.

10 Days' Free Trial or Money Back if unsatisfactory. If you wish to trade your present outfit for some other, write us for particulars.

Central Camera Co.

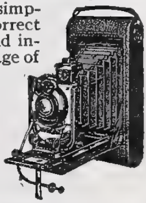
Dept. M-3
124 S. Wabash Ave., Chicago, Ill.

CONSISTENTLY BETTER RESULTS

THE REXO WAY

"Every Click a Picture"

REXO CAMERAS have five picture saving features which simplify photography, correct the user's mistakes and insure a higher percentage of good pictures. The Rexo Book explains these advantages in detail. Ask your dealer for a copy and choose a Rexo, for the sake of better pictures every time.



REXO RECORD FILM

insures clear, snappy negatives from which you will get quality pictures, particularly if made on REXO PAPER.

BURKE & JAMES, Inc.

Rexo Photo Products and Universal Motion Picture Cameras

CHICAGO - NEW YORK

Tennant and Ward's List

Wall's Dictionary of Photography

Tenth Edition, 1920. Revised to date and largely rewritten by F. J. Mortimer. 700 pages; 2,000 references. Cloth: postpaid $5.

The Photographic Researches of Ferd. Hurter and Vero C. Driffield

A Memorial Volume, edited by W. B. Ferguson and republishing all their original papers with a Bibliography of Later Work. 374 pages. Illus. Cloth $9.

Photograms of the Year 1921

An International Illustrated Review of the World's Progress in Pictorial Photography. Reports of the Great Exhibitions, a Critique and 86 Plates. Stiff paper covers $2.50. Cloth, $3.50 postpaid.

Penrose's Annual 1922

The Process Year Book and Review of Graphic Arts. Volume 24. Edited by W. Gamble. With 88 plates in color, gravure and other methods. Postpaid $4.

Practical Photo-Micrography

The Principles and Methods Plainly Explained for Beginners. A commonsense book. By Geo. West. 160 pages; with 8 plates, table, etc. Postpaid $2.50

Bromoil, Bromoil Transfer and Oil Prints

By James A. Sinclair, Fred Judge and other experts. Practical Working Methods. Illustrated. Postpaid $1.

Photographing Flowers and Trees

With an essay on "The Decorative Use of Natural Forms." By J. Horace McFarland. 93 pages; 35 illustrations. 50 cents.

The Photo-Miniature Series

Monographs on Photography. Edited by John A. Tennant. See special list for titles. Per copy 40 cents. Per year $4.

The Art of Retouching Negatives and Finishing and Coloring Photographs

Johnson's standard handbook. Rewritten and enlarged by Bruce and Braithwaite. Tenth edition 1920. Price $2.50.

Photography Made Easy

By R. Child Bayley. The best first book for beginners. Simple; practical. 261 pages. Stiff paper covers. $1.50.

We can supply any book on photography
—at the publisher's price. Send for list.

TENNANT AND WARD, PUBLISHERS
103 PARK AVENUE, NEW YORK

The Photo-Miniature: No. 168

How to Develop the Negative

A practical guide to all the methods approved in practice, explaining their advantages and giving working instructions covering their use—with formulas.

THE PRINCIPLES OF DEVELOPMENT

THE CLOSED TANK METHOD

THE OPEN TANK METHOD WITH CORE'S RACKS DESCRIBED IN DETAIL

THE FACTORIAL SYSTEM

WALLACE TIME AND TEMPERATURE METHODS

DEVELOPING UNKNOWN EXPOSURES

DEVELOPMENT AT HIGH TEMPERATURES

COMPARISON OF VARIOUS DEVELOPERS FOR CAPACITY

INSTANTANEOUS DEVELOPMENT

Price 40 cents postfree

TENNANT AND WARD
103 PARK AVE., NEW YORK

HOUSH SUPREME
QUALITY ALBUM

For 20 years these albums have been made uniformly good. If your dealer does not carry the full line, write for price list. The extensive variety shown will interest you.

THE HOUSH COMPANY, *Makers*
7-17 E. Concord St., Boston, Mass.

Wellington

BROMOIL PAPER

White Smooth and Cream Rough
in double weight only
The easiest paper to pigment

Send for our complete Bromoil List

Manufactured by
Wellington & Ward
Elstree, Herts
Sole United States Agents
RALPH HARRIS & CO.
26-30 Bromfield St., Boston, Mass.

AT every step in picture-making, ABE COHEN'S EXCHANGE can serve you--

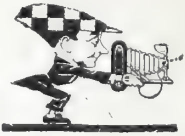
KODAKS, GRAFLEX AND VIEW CAMERAS SOFT FOCUS AND PORTRAIT LENSES

Enlarging Outfits
Photographic Papers
and Developers

BROMOIL SUPPLIES

Reduced prices on photographic apparatus now in effect.

ABE COHEN'S EXCHANGE
113 PARK ROW NEW YORK



Every Photographer should have

WILLOUGHBY'S MONEY SAVING BULLETIN

before placing orders for anything photographic

A Square Deal Always

WILLOUGHBY
Cameras & Supplies,
110 West 32 St. • • • • N.Y.

KALLITYPE AND ALLIED PROCESSES The Photo Miniature: No. 185. 40 cents. At your dealers. Working methods and formulas for plain Silver Prints, Platinotype, Silver-Platinum, Copper and Blue Print Papers.

Professional or Amateur Require the Best
tools obtainable for retouching

"CASTELL" PENCILS AND LEADS
give the best results

Absolutely Flawless
A. W. FABER, INC., NEWARK, N. J.

DUNN—THE LENS MAN

Bargains. Any Lens at the right price.
No List. Stock changing daily. I can save you money. Tell me your wants. Prompt reply.
HATHAWAY DUNN INC., 22 East 30th St., NEW YORK

Genuine HAND-MADE – and of exceptional PURITY

WHATMAN PAPERS for Photographic uses – SENSITIZING MOUNTING Etc.

Write us for free Sample book & information

H. REEVE ANGEL & CO., INC., 7 to 11 Spruce St. New York

1000 EXPERIMENTAL EXPOSURES
will not give you as much information as the
No. 2 HARVEY EXPOSURE METER
which costs $2.00, including Book 40 on
AUTOMATIC PLATE DEVELOPMENT
HARVEY MOTION PICTURE METER $2.00
Your dealer or G. L. HARVEY, 105 S. Dearborn St., Chicago

Clarence H. White School of Photography
SPRING SESSION—CANAAN, CONN.,
May 15 to May 31 "Blossom Time"
Special instruction in hand camera and pictorial work
For information, address 460 West 144 Street, NEW YORK CITY

HENRIETTA HUDSON
PERMANENT LANTERN SLIDES
For Technical and Educational Purposes
Direct Color Photography—Research Work—Consultation
BOLTON LANDING ON LAKE GEORGE, WARREN CO., N. Y.

USE THE CORRECT EXPOSURE
Milner LIGHT GAUGE
SIMPLE & CONVENIENT
NO Sensitized paper or renewals
NO Calculations or factors
NO eye strain—nothing to look through
DEALER OR DIRECT, POSTPAID $1.50. Money back if not satisfied
G. M. MILNER, - - - FAIRFAX, CALIF.

We carry a fairly complete stock of many of the
Out-of-Print Numbers
The Photo-Miniature
in good condition **50 cents.** Send prepaid order for numbers wanted. We will refund for all not supplied.
TENNANT AND WARD, 103 Park Ave., New York

FOR the amateur who wants good pictures, or for the serious worker who must have the best, it is well to have the development and printing done by one who has studied this kind of work and is willing to give the proper time and attention to it.

Developing, printing and enlarging at my place is all handled with the utmost care, and the results obtained are exceptionally satisfactory. Write for information about my methods.

MILES GREENWOOD, 84 Cottage Street, Melrose 76, Mass.
Work from my shop is a standard of excellence.

HIGGINS' PHOTO MOUNTER PASTE

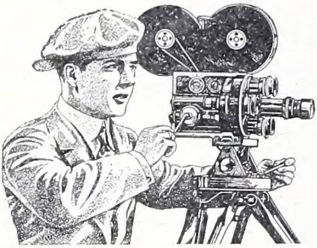
The kind you are sure to use
with continuous satisfaction

At Dealers Generally

Chas. M. Higgins & Co., *Manufacturers*
271 Ninth Street, Brooklyn, N. Y.

Branches:
Chicago, London

HOW TO BECOME A PROFESSIONAL PHOTOGRAPHER
EARNING $35 TO $125 A WEEK



An interesting booklet (free) on choosing a vocation, the opportunities photography offers you and how to avail yourself of these advantages.

Motion Picture—Commercial—Portraiture

Three to six months' course. Practical instruction. Modern equipment. Day or evening classes. Easy terms. Cameras and materials furnished free. Call or write for Catalog No. 24.

NEW YORK INSTITUTE of PHOTOGRAPHY
NEW YORK 141 W. 36th St.
CHICAGO 630 S. Wabash Ave.
BROOKLYN 505 State St.

A monthly magazine covering all that is best in photography.

ITS ADVERTISING PAGES KEEP YOU UP TO DATE

$1.50 a year, Sample Copy on request

CAMERA CRAFT PUBLISHING CO.

Claus Spreckels Building - San Francisco, California

COLOR PHOTOGRAPHY

An authoritative review of all the chief processes, giving a clear explanation of the underlying principles. The Photo-Miniature: No. 183. Fully illustrated, 40 cents.

By C. E. K. MEES, D.Sc.

At Your Dealers', or Direct from the Publishers

TENNANT AND WARD 103 Park Avenue, NEW YORK

The Photo Miniature

The most comprehensive reference library of photographic information in the English language.

8000 solidly packed pages, illustrated; unique in plan and arrangement. Every page self-indexed for quick reference.

Comprising 192 handbooks on photography, each complete in itself; each dealing with a different subject or phase of its subject.

Covering all the everyday uses and applications of photography with direct and practical instruction—theory and practice; much of it original and not obtainable elsewhere.

Giving the commonsense facts needed for an intelligent understanding and successful working of the processes, methods and formulas employed.

This describes a complete set of The Photo-Miniature: Vol. 1, No. 1 [1899] to Vol. XVI, No. 192 [1922] as published, strong paper covers

Price on Application

We can also supply many single copies of out-of-print numbers, in good condition for binding, at 50c each

TENNANT AND WARD, Publishers
103 PARK AVENUE NEW YORK, N. Y.

Kindly mention THE PHOTO-MINIATURE

Specify

ELON

The most highly refined of coal-tar developers. Elon is produced in our own laboratories under the supervision of chemists who know the requirements of a developer for photographic papers.

We make it—we know it's right.

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'